



MEMORANDUM

Date: August 21, 2019
To: Noah Rosen, Oakland Athletics
From: Rob Rees and Jordan Brooks, Fehr & Peers
Subject: **Howard Terminal Project AB 734 Analysis**

OK16-0125.05

Note: *This memorandum is an update of the memorandum of the same name dated February 8, 2019. It has been updated to reflect a non-ballpark trip generation methodology consistent with the City of Oakland's Transportation Impact Review Guidelines; provide more detailed explanations of the data used to calculate existing conditions at the ballpark and the methodology used to estimate ballpark mode choice; modify the mix of TDM measures selected as a representative Project 2.0 for the ballpark; and present information to be used for an analysis of greenhouse gas emissions due to the project.*

California Assembly Bill 734 (AB 734) provides that the construction of a new ballpark for the Oakland A's and an accompanying mixed-use development could have an expedited judicial review under the California Environmental Quality Act (CEQA). To qualify under AB 734, the project needs to meet several environmental standards, including a Transportation Management Plan (TMP) and Transportation Demand Management (TDM) Plan (Project 2.0) that combined achieve a 20-percent vehicle trip reduction (VTR) compared to operations absent the TMP and the TDM Plan (Project 1.0).¹ This requirement applies to both the ballpark and the non-ballpark development components of the project separately, and the 20-percent VTR needs to be achieved within one year after completing the first baseball season for the ballpark component and within one year after completing the non-ballpark development component.

EXECUTIVE SUMMARY

This memorandum details the calculation of trip generation estimates under Project 1.0 and Project 2.0 for the project's ballpark and non-ballpark development components at Howard Terminal. In

¹ The TMP will include the TDM measures from the TDM Plan, so for the purposes of this memo, the TMP and TMP measures are deemed to include the TDM measures.



addition, the memorandum provides a menu of potential TMP and TDM strategies with estimated VTR derived from each strategy where applicable. Proposed monitoring and evaluation methods verifying the effectiveness of the TMP and the TDM measures are also included.

The Howard Terminal site is located adjacent to the dense, walkable, multi-use urban environment of Downtown Oakland and the Jack London District that provide close and convenient access to residential, office, retail, restaurant, and entertainment uses. Nearby transit options are plentiful, as the site is adjacent to the Oakland Jack London Square Ferry Terminal, less than 1 mile from the 12th Street Oakland City Center and West Oakland BART stations, about half a mile from the Oakland Jack London Amtrak station, and within a 10- to 15-minute walk of 13 AC Transit local bus lines, two Transbay bus lines, and the Broadway Shuttle.

The area is also conducive to bicycling, with Class II bicycle lanes currently provided on 2nd Street, 3rd Street, Market Street, and Washington Street in the project vicinity and Class IV separated bikeways proposed for 3rd Street, Market Street, and Martin Luther King Jr Way in the 2019 Oakland Bike Plan. To take advantage of the dense, walkable environment and further encourage non-automobile modes of travel, the project will improve connectivity for transit and active modes in the area.

Howard Terminal would be developed to include a 35,000-attendee capacity ballpark, as well as non-ballpark development that includes a 3,500-seat performance theater, 3,000 residential units, 1.564 million square feet of office space, a 400-room hotel, and 270,000 square feet of commercial space.

The ballpark would host 81 regular season baseball games, one to two pre-season games, and up to 11 post-season games. Three to 15 concerts would occur each year, and there would be about 35 other small events, 100 corporate / community events, and up to 16 events at the plaza adjacent to the ballpark. The 3,500-seat performance theater would host roughly 100 events each year.

For the ballpark component of the project, a travel mode choice model was constructed to estimate trip generation for Project 1.0 and Project 2.0. Project 1.0 considers a ballpark at Howard Terminal operated in the same way that the A's operate at the Coliseum, maintaining existing personal vehicle parking availability and before the implementation of any measures to manage vehicle trip generation or attempt to encourage non-automobile transportation. Project 2.0 is a description of the project after the implementation of a TMP and TDM strategies to achieve a 20-percent VTR.¹

¹ Although the City of Oakland is acting as lead agency, the project is located within Port of Oakland jurisdiction, where the City of Oakland's Standard Conditions of Approval (SCAs) do not apply. The City of



Compared to the Coliseum, a ballpark at Howard Terminal would induce three primary changes in the travel patterns of attendees, each of which were addressed in the model.

- Attendees who currently take BART to the Coliseum from origins in and around downtown Oakland will shift modes to access a ballpark at Howard Terminal.
- Attendees who currently drive to the Coliseum from origins near Howard Terminal will shift modes to access a ballpark at Howard Terminal.
- Attendees from south or southeast of the Coliseum site, for whom the Howard Terminal site represents a longer travel distance, may no longer attend games, replaced by those for whom games would be more conveniently located.

A wide variety of TMP measures were considered and studied as part of a program to achieve VTR goals for the ballpark at Howard Terminal. The project will make improvements to the pedestrian experience in the area, and a menu of potential additional options studied in this memorandum to reduce vehicle trips is provided in **Table ES-1**. Of the measures listed in Table ES-1, the following are preferred measures:

- Provide free bicycle and scooter parking with security oversight and the ability to serve 500 bicycles and scooters.
- Move bus stops to provide high-frequency AC Transit service adjacent to the ballpark.
- Provide free shuttle service between the ballpark and the 12th Street, West Oakland, and Lake Merritt BART stations.
- Manage parking supply, with the following strategies used for modeling purposes:
 - Reduce the number of on-site ballpark parking spaces from 6,800 to 3,500.
 - Manage the parking supply of nearby off-site garages using management agreements to maintain an occupancy rate of no more than 95%.
 - Manage parking supply of nearby on-street spaces using pricing, extended enforcement hours, and/or time restrictions to maintain an occupancy rate of no more than 85%.
 - Expand residential parking programs in West Oakland and Downtown Oakland
- Reserve a portion of the closest on-site parking spaces for vehicles with 4+ occupants
- Manage TNC operations by constructing a geofence near the ballpark before and after baseball games and large events for transportation network company (TNC) vehicles, with

Oakland SCAs are therefore not required for the project. However, some measures like City of Oakland SCAs may be imposed as mitigations through the environmental review process.



a TNC fee rationing access to the pick-up/drop-off zones on-site and nearby off-site. Physical barriers and traffic control officers would enforce the geofence area.

TABLE ES-1: DESCRIPTION OF BALLPARK TMP MEASURES AND VTR ESTIMATE

TMP Category	TDM Measures	VTR Estimate ¹
Encourage Walking and Bicycling	Develop Howard Terminal with high-density housing and office uses	0-2%
	Provide a free bicycle/scooter valet parking service for at least 500 bicycles and scooters	
Better Transit Options	Gameday special event ferries between the Oakland Jack London Square ferry terminal and San Francisco, Alameda, Richmond, and/or Vallejo	1-10%
	Move bus stops to provide high-frequency AC Transit service adjacent to the ballpark	
	Provide transit reimbursement equivalent to one roundtrip fare on AC Transit included in the ticket price	
Downtown Connections	Gameday shuttles between 12th Street BART station and the ballpark	2-6%
	Additional gameday shuttles between West Oakland and Lake Merritt BART stations and the ballpark	
	Gondola service between 12th Street and the ballpark	
Parking Supply Management	Reduce the number of on-site parking spaces available for ballpark attendees to 3,500	0-11%
	Use pricing to maintain an 95% occupancy rate at nearby off-site garages	
	Use pricing to maintain an 85% occupancy rate at nearby on-street spaces	
	Prohibit on-street parking by ballpark attendees near the ballpark	
Reduced Vehicle/ Trip Demand	Expand residential parking programs in West Oakland and Downtown Oakland	3-14%
	Reserve a portion of the closest on-site parking spaces for vehicles with 4+ occupants	
	Manage TNC operations by constructing a geofence near the ballpark before and after baseball games and large events for TNC vehicles. Enforce the geofence area via physical barriers and traffic control officers.	
	Implement a TNC fee rationing access to the pick-up/drop-off zones on-site and nearby off-site.	

1. VTR estimate is calculated for baseball games at full attendance.

Source: Fehr & Peers, 2019.

A subset of the preferred TMP measures listed above were assessed as comprising Project 2.0 for the purposes of this memorandum to illustrate how the A's could achieve the 20-percent vehicle trip reduction, although these measures may not represent the final list of implemented measures. **Table ES-2** presents the trip generation and VTR estimates for a ballpark Project 2.0 consisting of the following TMP measures:



- Provide free bicycle and scooter parking with security oversight and the ability to serve 500 bicycles and scooters.
- Manage parking supply, with the following strategies used for modeling purposes:
 - Reduce the number of on-site ballpark parking spaces from 6,800 to 3,500.
 - Manage the parking supply of nearby off-site garages using management agreements to maintain an occupancy rate of no more than 95%.
 - Manage parking supply of nearby on-street spaces using pricing, extended enforcement hours, and/or time restrictions to maintain an occupancy rate of no more than 85%.
 - Expand residential parking programs in West Oakland and Downtown Oakland
- Manage TNC operations by constructing a geofence near the ballpark before and after baseball games and large events for TNC vehicles, with a TNC fee rationing access to the pick-up/drop-off zones on-site and nearby off-site. Physical barriers and traffic control officers would enforce the geofence area.

TABLE ES-2: BALLPARK VEHICLE TRIP GENERATION AND VTR

Scenario	Weekday Evening ¹	Weekday Day ¹	Weekend ¹	Concert ^{2, 3}	Weighted Average ⁴
Project 1.0	27,300	27,800	28,600	22,800	27,300
Project 2.0	21,900	20,100	22,600	19,300	21,600
VTR	20%	28%	21%	15%	21%

1. Includes 35,000 attendees and 1,320 employees

2. Includes 28,000 attendees and 1,200 employees

3. The concert venue trip generation can be adjusted based on attendance and staff to represent the other smaller events, corporate / community events, and plaza events anticipated to be held at the ballpark.

4. The weighted average calculated based on 41 weekday evening games, 14 weekday day games, 27 weekend games, and 9 concerts.

Source: Fehr & Peers, 2019.

The non-ballpark development must also achieve a 20-percent reduction in vehicle trips to receive the benefits conferred by AB 734. Travel patterns for the non-ballpark development are expected to be like other land uses with similar locations and characteristics, so Project 1.0 trip generation was calculated using standard methodologies per the City of Oakland guidelines. Project 2.0 includes parking reductions, operational strategies, and physical improvements. Although these TDM elements are all commonly used in TDM programs, many of them are difficult to model, so trip generation calculations conservatively focused primarily on parking reductions to affect the number of vehicle trips. **Table ES-3** presents the trip generation and VTR estimates for non-ballpark development Project 2.0 with the following elements:



- Adhere to parking maximums of:
 - 1.0 parking spaces per residential unit
 - 2.0 parking spaces per 1,000 square feet office
 - 2.6 parking spaces per 1,000 square feet retail / restaurant
 - 0.5 parking spaces per hotel room
 - parking spaces for the performance venue would be shared with the ballpark
- Utilize the hotel on gamedays to host visiting players, staff, and media, who will generate a limited number of external vehicle trips compared to typical guests.
- Construct physical improvements that help facilitate travel by modes other than automobiles, including filling in sidewalk gaps, widening sidewalks, upgrading crosswalks and curb ramps, providing curb extensions, and developing corridor-level bikeways.
- Execute on-going operational strategies, such as unbundled parking and designated carshare spaces, to reduce automobile ownership and encourage non-automobile travel.

The results presented in Table ES-3 illustrate VTR reductions on days without and with the performance venue. Days on which a baseball game and an event at the performance venue overlap, an additional 3% VTR could be achieved due to the limited parking supply for the performance venue, but these reductions were not considered in the annual VTR calculations because a detailed event scheduling plan is not available.

Table ES-3 shows Project 2.0 trips on gamedays, when about one half of the hotel would cater to the visiting baseball team and related activities. On non-gamedays, overall VTR for the development would be about 4% less. Over the course of one year with 81 baseball games and 100 events at the performance venue, the weighted average VTR for the non-ballpark development is 20%.

The rest of this memorandum details the methodology and results of the trip generation estimates presented in Table ES-1, Table ES-2 and Table ES-3. It also describes in detail a menu of available measures (including those not considered part of Project 2.0) for both the ballpark and non-ballpark development, with individual VTR estimates available for ballpark measures. A discussion of monitoring, evaluation, and enforcement is also provided.



TABLE ES-3
VTR ESTIMATES FOR HOWARD TERMINAL NON-BALLPARK DEVELOPMENT

Land Use	Weekday			Weekend		
	Project 1.0	Project 2.0	VTR	Project 1.0	Project 2.0	VTR
Residential	7,600	5,500	-28%	7,000	5,100	-28%
Office	9,700	7,300	-24%	1,400	1,100	-24%
Retail	5,700	4,800	-16%	5,900	5,000	-16%
Restaurant	6,400	5,400	-16%	7,400	6,200	-16%
Hotel ¹	2,600	1,300	-50%	2,000	1,000	-50%
Performance Venue	2,900	2,900	-0%	2,900	2,900	-0%
Total with Venue	34,900	27,200	-22%	26,600	21,300	-20%
Total Without Venue	32,000	24,300	-24%	23,700	18,400	-22%

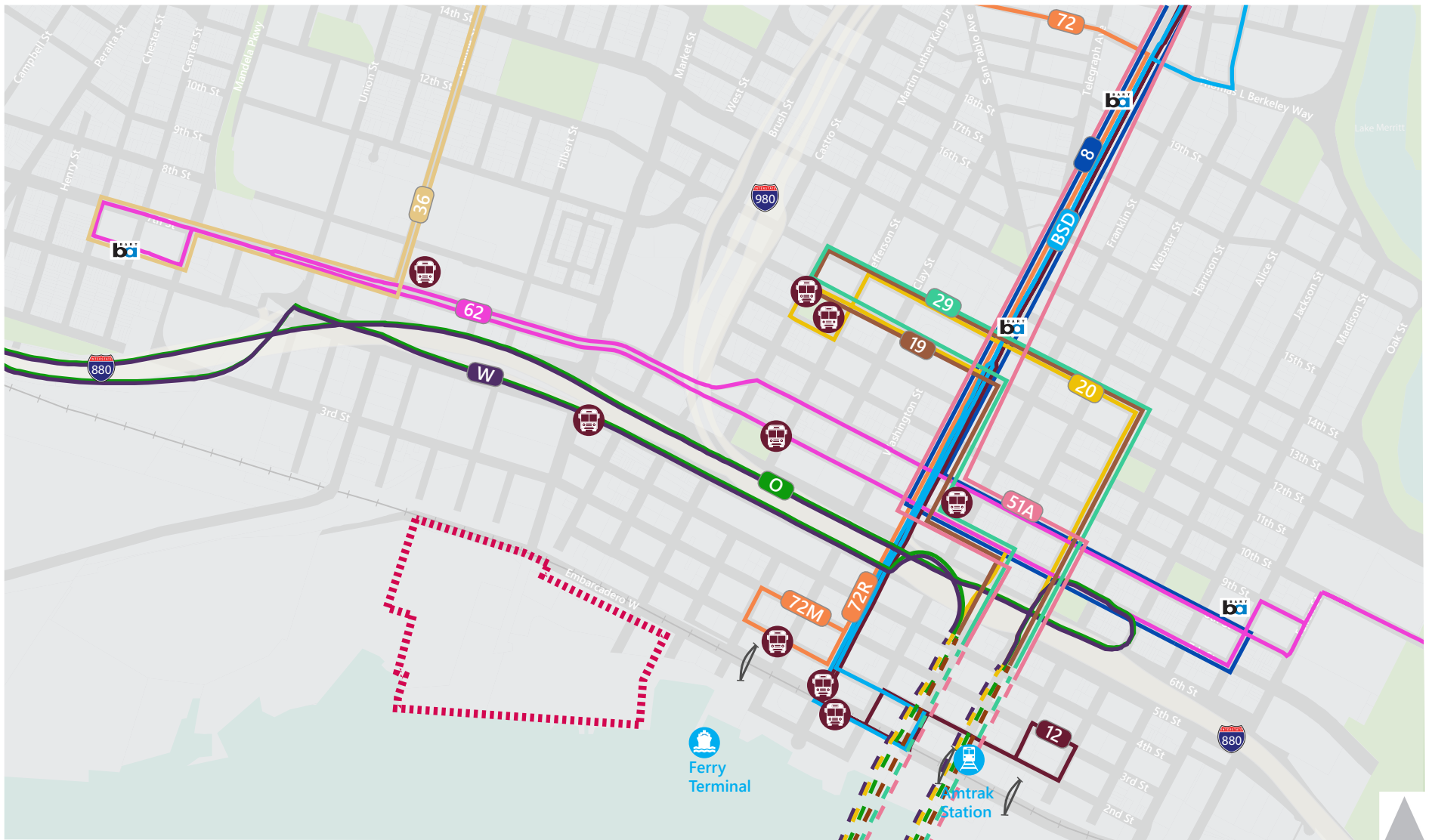
1. Project 2.0 trips presented for the hotel apply to gamedays only. On non-gamedays, Project 2.0 hotel trips would be 2,600 trips and 2,000 trips for weekdays and weekends, respectively.
















Source: Fehr & Peers, 2019.

1 PROJECT CONTEXT

This memorandum details the calculation of trip generation estimates under Project 1.0 and Project 2.0 for the project's ballpark and non-ballpark development components at Howard Terminal. In addition, the memorandum provides a menu of potential TMP and TDM strategies with estimated VTR derived from each strategy where applicable. Proposed monitoring and evaluation methods verifying the effectiveness of the TMP and the TDM measures are also included.

The Howard Terminal site is located adjacent to the dense, walkable, multi-use urban environment of Downtown Oakland and the Jack London District that provide close and convenient access to residential, office, retail, restaurant, and entertainment uses. Nearby transit options are plentiful, as the site is adjacent to the Oakland Jack London Square Ferry Terminal, less than one mile from the 12th Street Oakland City Center and West Oakland BART stations, about half a mile from the Oakland Jack London Amtrak station, and within a 10- to 15-minute walk of 13 AC Transit local bus lines, two Transbay bus lines, and the Broadway Shuttle. A map of transit in the project area is presented in **Figure 1**.



- | | | | |
|--|---|--|--|
|  Route 8 |  Route 29 |  Route 72, 72M, 72R |  Bus Stop |
|  Route 12 |  Route 36 |  Route O |  Existing Pedestrian Connection |
|  Route 19 |  Route 51A |  Route W |  Project Study Area Boundary |
|  Route 20 |  Route 62 |  Broadway Shuttle | |



Existing Transit Services and Selected Stops



The area is also conducive to bicycling, with Class II bicycle lanes currently provided on 2nd Street, 3rd Street, Market Street, and Washington Street in the project vicinity and Class IV separated bikeways proposed for 3rd Street, Market Street, and Martin Luther King Jr Way in the draft 2019 Oakland Bike Plan. A map of bicycle facilities in the project area is presented in **Figure 2**.

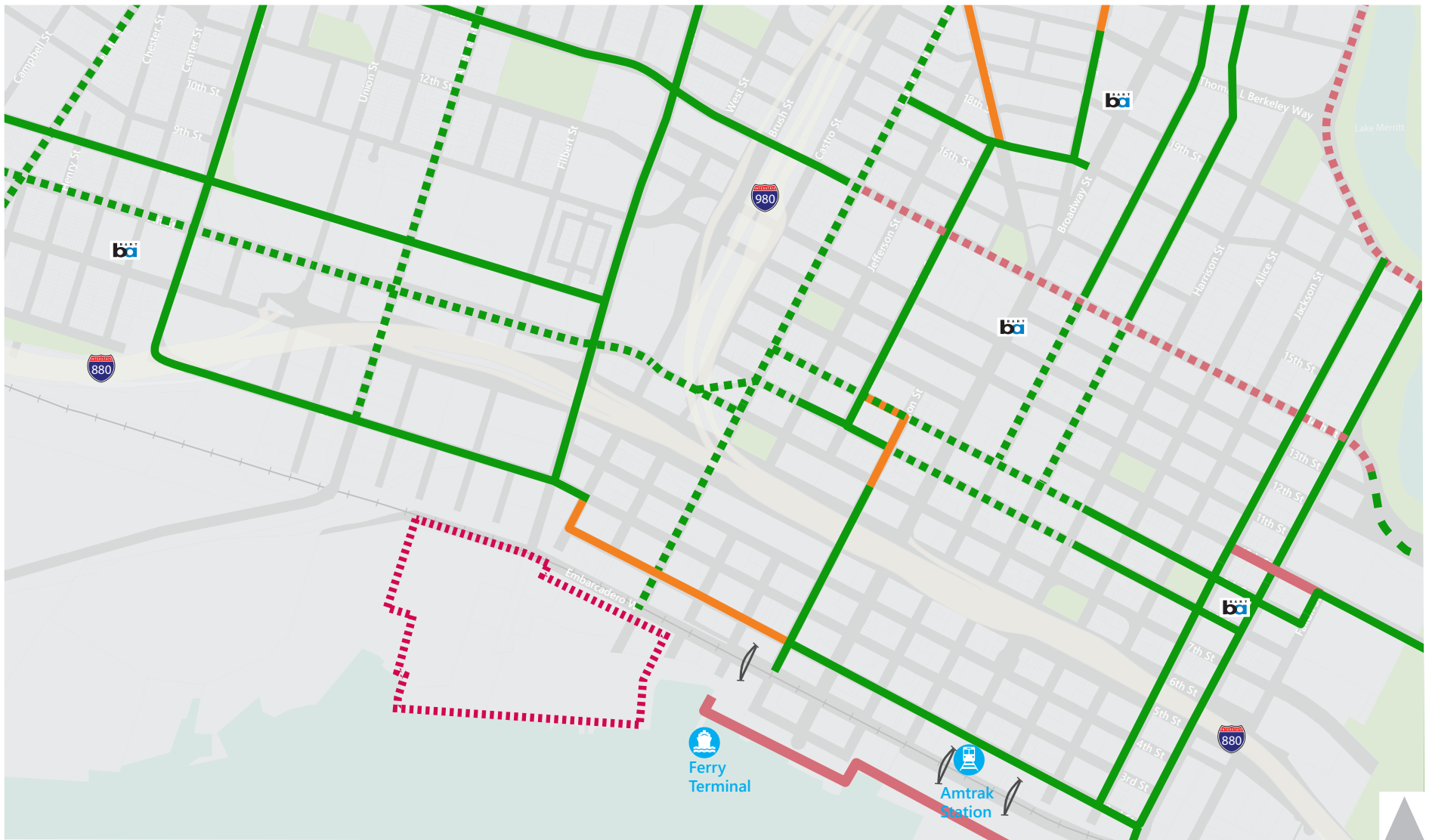
Howard Terminal would be developed to include a 35,000-attendee capacity ballpark, as well as non-ballpark development that includes a 3,500-seat performance theater, 3,000 residential units, 1.564 million square feet of office space, a 400-room hotel, and 270,000 square feet of commercial space.

2 BALLPARK

The Howard Terminal Ballpark would be constructed on the eastern portion of the Howard Terminal site and have a 35,000-person capacity. Absent a TMP, the ballpark would also include 6,800 parking spaces with at-grade vehicle access at Market Street and at Martin Luther King Jr Way. Howard Terminal is currently used to support Port of Oakland operations with truck parking, container storage, and longshoreman training and administration. These existing uses would likely relocate to other Port properties, and the associated vehicle trips would remain on the network, albeit at somewhat different locations.

Three types of gameday scenarios were studied: weekday evening games, which typically start around 7:00 PM; weekday day games, which typically start around 12:30 PM; and weekend games, which typically start at either 1:00 PM or 6:00 PM. Around half of A's home games are weekday evening games, about one-sixth are weekday day games, and about one-third are weekend games.

The ballpark is anticipated to occasionally host large special events, such as concerts, providing at most 28,000 people for these events. These events would be like the larger events that now occur at the Oracle Arena. Like the baseball games, vehicle trips for these events were estimated under Project 1.0 (before the TMP) and then under Project 2.0 (after the TMP) with a set of TMP strategies to assess VTR.



NOTE: Proposed routes are within the City of Oakland Bicycle Master Plan (2007).
City will fund proposed bicycle infrastructure through street repaving projects.



Bicycle Circulation to Howard Terminal

Existing

Class II Bicycle Lane

Class III Bicycle Route

Class IV Bicycle Route

Existing Pedestrian Connection

Proposed

Class II Bicycle Lane

Class IV Bicycle Lane

Project Study Area Boundary





2.1 DATA SOURCES

A variety of data describing the existing travel behavior of attendees to A's games at the Coliseum and attendees to the larger popular events at Oracle Arena was collected to help develop Howard Terminal Ballpark trip generation estimates. A brief description of the data, the data provider, and what the data was used for is presented in **Table 1** on the following page.

2.2 BASEBALL GAME PROJECT 1.0 TRIP GENERATION

Trip generation calculations are based on at-capacity attendance at the ballpark. Games at capacity represent the highest impacts of the ballpark on the transportation system, and it is therefore essential to ensure that the TMP strategies reduce vehicle trips to a satisfactory extent under these conditions. To the extent that actual attendance is typically below capacity, trip generation would be less than is calculated here.

Project 1.0 conditions for Howard Terminal represent the operations before imposition of measures to manage vehicle generation. 6,800 parking spaces would be provided¹ to maintain today's personal vehicle parking availability on Howard Terminal, and Project 1.0 does not include measures to attempt to encourage non-automobile transportation. Both Market Street and Martin Luther King Jr Way would remain as four-lane streets as they are under existing conditions to maximize vehicle throughput to and from Howard Terminal. Existing sidewalks on these streets would remain as they are under existing conditions, with no additional enhancements. On-site and off-site pick-up/drop-off and waiting zones for transportation network companies (TNCs) like Lyft and Uber are considered part of the Project 1.0 conditions but without operational strategies to maximize efficiency and minimize vehicle congestion.

Instead of making assumptions about global changes to mode split, the trip generation analysis in this memorandum models the impact of moving to Howard Terminal by assessing the mode choice impact on specific geographies to build a global mode shift estimate.

¹ The Coliseum provides around 9,100 spaces for a 47,000-seat baseball capacity. 6,800 spaces at the Howard Terminal Ballpark maintains the same ratio of parking spaces-to-seat capacity.



TABLE 1
SUMMARY OF DATA SOURCES USED FOR BALLPARK TRIP GENERATION

Data	Data Provider	Use
BART Hourly Origin-Destination Volumes ¹	BART	-Existing Gameday/Event BART Mode Share -Geographic Distribution of BART Rider Attendees
Coliseum Turnstile Attendance ²	Oakland A's	-Existing Gameday Mode Share at Coliseum
Oracle Arena Concert Attendance ³	Billboard	-Existing BART Mode Share for High-Demand Concerts at Oracle Arena
Vehicle Origin-Destination Distribution ⁴	StreetLight Data	-Geographic Distribution of Vehicle Attendees -Driver Second-Choice Mode Preferences
Driveway Counts ⁵	IDAX	-Gameday/Event TNC Mode Share
Vehicle Occupancy ⁶	Fehr & Peers	-Gameday/Event Average Vehicle Occupancy
Downtown Oakland Parking Supply and Occupancy ⁷	City of Oakland	-Parking Spaces Available for Ballpark Attendees

Notes:

1. BART hourly origin-destination volumes can be found at <http://64.111.127.166/origin-destination/>. Data collected for A's games during the 2017 season.
2. Per-game data collected for A's games during 2017 season.
3. Six large weekend evening concerts at Oracle Arena in 2017 were studied, using data from Billboard Boxscore:
 - Red Hot Chili Peppers (3/12)
 - Panic! At the Disco (3/25)
 - Roger Waters (6/10)
 - Arcade Fire (10/21)
 - Enrique Iglesias and Pitbull (10/28)
 - Jay-Z (12/16)
4. Based on cell phone location-based services data collected for A's games played between July 2016 and September 2017. More information on the data source can be found at <https://www.streetlightdata.com/>.
5. Driveway counts of entering and exiting vehicles were collected at the main gate and gates with significant traffic on one game day for each type (weekday evening, weekday day, and weekend) during September 2018. Counts were collected from two hours prior to the game's start time to two hours after the final out.
6. Field observations of vehicle occupancy were collected at the main gate for a weekend game in September 2018. Counts were collected from two hours prior to the game's start time to 30 minutes after the start time.
7. Parking supply data included on-street and publicly available off-street spaces. Occupancy data included availability on each block and lot/garage at 1:00 PM and 7:00 PM on weekdays and Saturday at 1:00 PM. Supply and occupancy data were collected in 2015. Parking supply was adjusted to reflect parking lots developed since 2015, but demand at the lots were maintained.

Source: Fehr & Peers, 2019.



2.2.1 EXISTING GAMEDAY TRAVEL BEHAVIOR AT THE COLISEUM

Calculation of Project 1.0 trip generation for the Howard Terminal Ballpark begins with the mode split of attendees to the existing Coliseum. For home games during the 2017 season, BART hourly ridership data by origin-destination pairs was used to calculate the average number of exits at the Coliseum BART station on each of the three gameday types three hours before the scheduled start time to one hour after the scheduled start time. The average volume of Coliseum exits during those times on days without a game was then subtracted to estimate BART riders traveling to the Coliseum for the A's game. Days on which other events occurred at either the Coliseum or Oracle Arena were excluded from the analysis. Variable game end times make it difficult to accurately describe departure mode split using historical data, so the departure mode split was estimated to be like the arrival mode split.

These BART ridership numbers were compared against the average turnstile attendance in the 2017 season for each of the game types to calculate the BART mode share, as presented in **Table 2**. Almost all other attendees travel to games at the Coliseum by automobile. Land use intensity near the Coliseum is low, bus service is limited, and field observations found a negligible number of attendees arriving to the main entrance on foot or by bus. While attendees arriving via other modes may also access the Coliseum through the BART station pedestrian bridge, this is unlikely to describe a significant number of attendees.

TABLE 2
EXISTING BART RIDERSHIP CALCULATIONS

Game Type	Coliseum BART Station Ridership			Average Attendance ²	BART Mode Share ³
	Non Gameday	Gameday	Estimated BART Attendees ¹		
Weekday Evening	1,991	4,786	2,795	11,868	23%
Weekday Day	600	2,590	1,990	8,879	22%
Weekend	397	3,618	3,221	17,086	19%

Notes:

1. Calculated by subtracting gameday ridership from non-gameday ridership
2. Average turnstile attendance for the 2017 season
3. Calculated by dividing estimated number of attendees using BART by the turnstile attendance

Source: BART, Fehr & Peers, 2019.

The share of attendees arriving by TNC was estimated by using driveway counts from one game of each game type in September 2018. Vehicles exiting the Coliseum between two hours prior and one hour after game start were treated as TNCs, and that number was compared to the total number of vehicles entering the site during that time. The exiting percentage across the three game types was averaged due to the small sample size, and the average TNC rate of 9% of all entering



vehicles¹ was established and applied to all three game types. **Table 3** presents the estimated mode of access for attendees to the Coliseum ballpark for each of the three game types.

TABLE 3
EXISTING COLISEUM BALLPARK MODE OF ACCESS

Mode	Weekday Evening	Weekday Day	Weekend
Drive	70%	71%	74%
TNC ¹	7%	7%	7%
BART	23%	22%	19%
Walk/Bike/Other Transit ²	*	*	*

Notes:

1. Based on driveway count data, TNCs were estimated to comprise 9% of total vehicle use
2. Negligible use of other modes observed during field visits

Source: Fehr & Peers, BART, 2019.

Based on the BART origin-destination data, the distribution of BART riders to baseball games at the Coliseum is presented in **Figure 3**. The distribution of vehicle trips to baseball games at the Coliseum was estimated using location-based services cell phone data collected for the 2016 and 2017 seasons and is presented in **Figure 4**.

Moving to a ballpark at Howard Terminal would induce three overarching changes in travel patterns of attendees that must be addressed to model Project 1.0 trip generation. These changes are discussed in the next sections and include:

- Attendees who currently take BART to the Coliseum from origins in and around downtown Oakland will shift modes to access a ballpark at Howard Terminal.
- Attendees who currently drive to the Coliseum from origins near Howard Terminal will shift modes to access a ballpark at Howard Terminal.
- Attendees from south or southeast of the Coliseum site, for whom the Howard Terminal site represents a longer travel distance, may no longer attend games, replaced by those for whom games would be more conveniently located.

Most attendees from outside of an approximately five-mile radius of Howard Terminal were modeled as experiencing zero mode shift from a move to Howard Terminal. Mode choice estimation models like the Alameda County Transportation Commission (Alameda CTC) Travel

¹ Given the estimated BART mode shares, 9% of the entering vehicles (i.e. of the non-BART mode share) represents a 7% overall TNC mode share.



Model predict mode split based on travel preferences for typical trip purposes and are therefore not well-suited to predict mode share for baseball games, which have unique travel characteristics and attendee desires. As such, the observed travel preferences of attendees were used to estimate mode shares, except for attendees for whom the move represented a substantial change in the desirability or feasibility of their travel options.

Tables with data regarding existing distributions and the mode splits and geographic shifts used as inputs for arrivals and departures for each game type can be found in **Appendix A**.

2.2.2 MODE SHIFT OF CURRENT BART RIDERS

Some attendees who currently take BART to the Coliseum would switch modes to attend games at Howard Terminal. Depending on the origin station, varying proportions of attendees would switch to TNCs, walking, bicycling,¹ buses, or ferries. Attendees who currently use BART to attend games were estimated to continue to be non-drivers, and therefore none would switch to driving a personal vehicle.

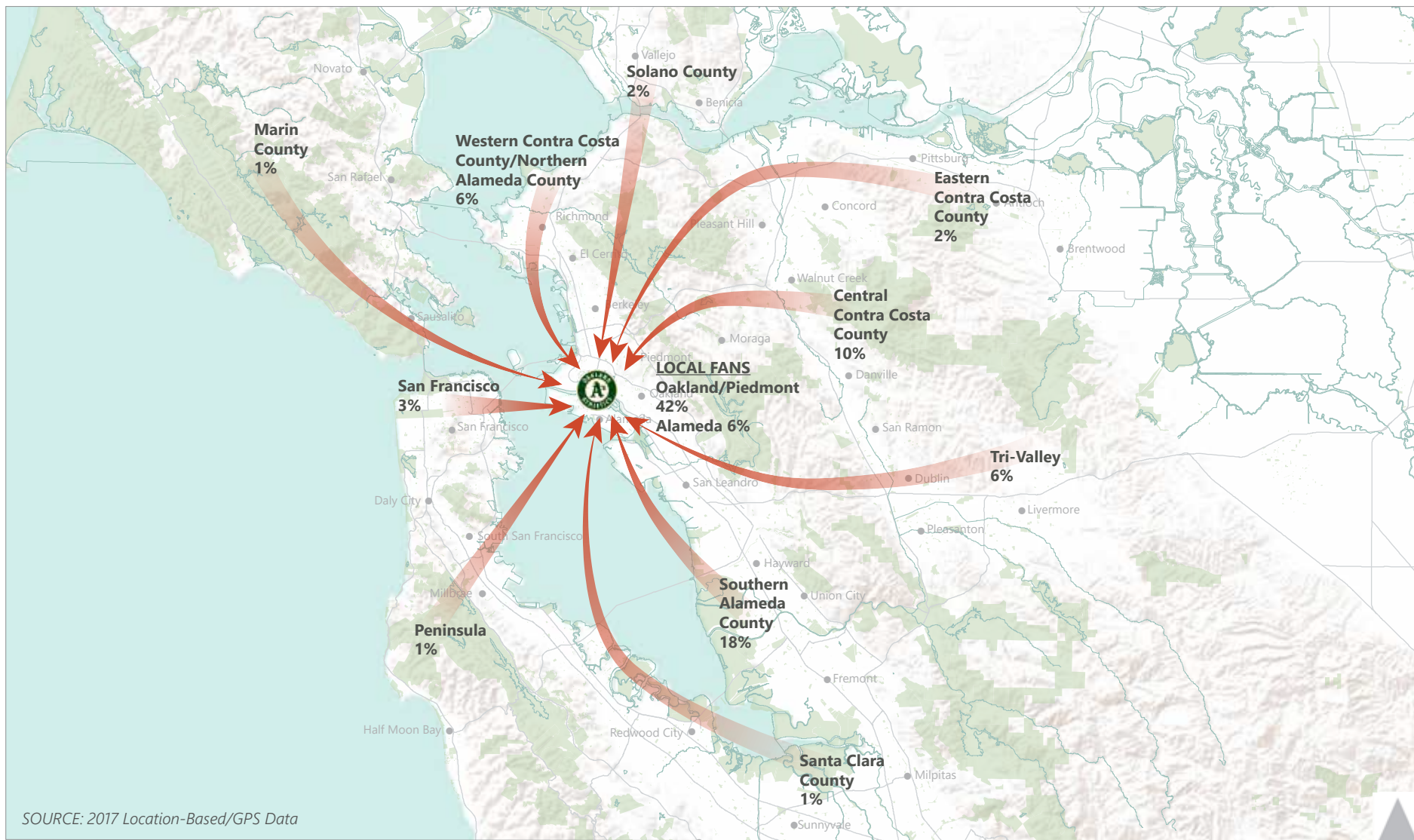
Attendees who take BART from the three Downtown Oakland BART stations or the West Oakland BART station to games at the Coliseum would not utilize BART if games were played at Howard Terminal. West Oakland, 12th Street Oakland City Center, and Lake Merritt stations are the three closest stations to Howard Terminal and are roughly equidistant. The 19th Street Oakland station is also close to Howard Terminal, and attendees would not ride BART to travel from 19th Street to 12th Street. In Project 1.0 without a TMP strategy, riders from these closest stations would mostly either walk to the ballpark or take a TNC, with a small percentage bicycling or taking the Broadway Shuttle (for weekday games only, as the Broadway Shuttle does not operate on weekends).

Some riders who currently take BART to the Coliseum from the MacArthur, Ashby, Rockridge, or Fruitvale BART stations would switch modes to TNCs, as the closer location makes these rides more economical, and the ability to use local roads and the greater distance of the ballpark from BART stations makes TNC rides more time competitive. Lastly, some attendees who currently take BART from the San Francisco stations of Embarcadero and Montgomery would switch to ferries for the game types and times when convenient ferry service is provided. Under Project 1.0 conditions, this is primarily arrivals for weekday evening games and departures from weekend games, as ferry service for other time periods is either not provided or not well-timed to game attendance needs.

¹ Bicycling includes shared micro-mobility options like docked and dockless bike share and e-scooters.



Weekday Evening Game Geographic Distribution of Oakland A's Game Attendees Who BART



Weekday Evening Game Geographic Distribution of Oakland A's Game Attendees Who Drive



2.2.3 MODE SHIFT OF CURRENT DRIVERS

Some attendees who currently drive to the Coliseum from areas near Howard Terminal would also switch modes to attend games at Howard Terminal. Most attendees within one mile of the Howard Terminal Ballpark would switch to walking, with some taking TNCs, and a small percentage bicycling, taking a bus, or continuing to drive themselves. At one to two miles from Howard Terminal, most current drivers were estimated to switch to TNCs, with a substantial minority continuing to drive themselves and a smaller percentage bicycling or taking a bus to the new ballpark. For current drivers between two and five miles from the Howard Terminal site, the majority were estimated to remain drivers to a ballpark at Howard Terminal, with almost all of those who switched modes using TNCs.

In addition to attendees close to Howard Terminal, some who drove to the Coliseum from locations less than about 1.5 miles away from the Coliseum would also change modes, as driving from those locations becomes much more onerous with a move to Howard Terminal. Half of these drivers were estimated to continue to drive, with most others shifting to BART or TNCs.

2.2.4 GEOGRAPHIC SHIFT OF ATTENDEES

Moving to a new ballpark at Howard Terminal would not only cause mode shift for some current attendees, but also result in a new geographic distribution of attendees. Fewer attendees would hail from areas south or southeast of the Coliseum, as travel distances and travel times would increase for those fans, while areas with shorter travel times and distances to Howard Terminal would have a larger distribution of attendees.¹

BART riders from south of the Coliseum station would have their travel times increased by at least 30 minutes to get to the Howard Terminal Ballpark compared to the Coliseum. Additionally, all riders at stations from Castro Valley and beyond along the Dublin/Pleasanton line, and some riders at stations from Hayward and beyond along the Warm Springs/South Fremont line, would either change trains at Lake Merritt to get to 12th Street, continue to the West Oakland station, or walk the additional distance from the Lake Merritt station to the ballpark. Because of these factors, ridership from stations south or southeast of Bay Fair was reduced.

Drivers from south of the Coliseum would also see their travel times increased with the move to Howard Terminal. Although Howard Terminal is only about six miles north of the Coliseum, that

¹ See **Appendix B** for supporting evidence regarding trip distribution changes from ballpark relocations.



travel would be during peak commuting hours for arrivals to weekday evening games and departures from weekday day games. As such, the number of drivers from locations more than 20 miles south or southeast of Howard Terminal were reduced. Traffic on weekends is less peaked, but the longer travel distances would still discourage some people from those locations from attending.

Geographic locations with gains in attendance, by contrast, would be concentrated in close-in areas in Oakland and Alameda, as well as other areas where Howard Terminal represents a more convenient trip, like San Francisco and central Contra Costa County. The distribution of these attendance gains was taken from a proprietary analysis performed by the A's. The mode split of attendees from these locations varied depending on availability and ease of transportation options.

2.2.5 ESTIMATED PROJECT 1.0 MODE SPLIT AND TOTAL VEHICLE TRIPS

From the calculations described above, the mode split of attendees under Project 1.0 was estimated. Available parking supply—from on-site, plus on-street spaces and off-site garages within one-mile walking distance of the ballpark—was enough to provide a parking space to all attendees who would prefer to drive during each game time.

Because the total number of personal vehicles arriving needs to equal the total number of vehicles departing, the maximum drive mode share between arrivals and departures was used for each game type. All other modes were then adjusted based on their relative proportions.

From the mode splits, total vehicle trips were calculated by assigning two trips total to each personal vehicle—one trip on arrival and one on departure—as well as two trips for each arriving TNC and two trips for each departing TNC to account for the fact that each TNC trip must both enter and exit the area. Employee trips were also considered, using an estimate of 1,320 employees with a 15-percent drive mode share. The mode split for attendee arrivals and departures for each game type is presented in **Table 4**, in addition to the total vehicle trips (including employee trips).

2.3 SPECIAL EVENT PROJECT 1.0 TRIP GENERATION

Special events, typically concerts, held at the Howard Terminal Ballpark are anticipated to have a maximum 28,000 attendees, and a similar process as described above for baseball games was performed to calculate trip generation estimates for these special events. Existing mode of access was calculated using BART data for high-demand concerts at Oracle Arena in 2017, and the proportion of TNCs to private vehicles was estimated to be like what was observed at baseball games. **Table 5** summarizes estimated mode of access for existing special events at Oracle Arena.



TABLE 4
PROJECT 1.0 HOWARD TERMINAL BALLPARK MODE SPLIT AND TRIP GENERATION

Mode	Weekday Evening		Weekday Day		Weekend	
	Arrivals	Departure	Arrivals	Departures	Arrivals	Departure
Drive	57%	57%	56%	56%	62%	62%
TNC	18%	18%	19%	19%	18%	18%
Walk	3%	2%	3%	3%	2%	2%
Bicycle	<1%	<1%	<1%	<1%	<1%	<1%
Ferry	1%	<1%	<1%	<1%	<1%	<1%
Bus	1%	1%	1%	1%	1%	1%
BART	20%	22%	21%	20%	18%	17%
Total Vehicle Trips	27,300		27,800		28,600	

Source: Fehr & Peers, 2019.

TABLE 5
EXISTING ORACLE ARENA SPECIAL EVENT MODE OF ACCESS

Access Mode	Mode Share ¹
Drive	73%
TNC ¹	7%
BART	20%
Walk/Bike/Other Transit ²	*

Notes:

- Based on BART and Billboard data for the following high-demand concerts at Oracle Arena in 2017:
 - Red Hot Chili Peppers (3/12)
 - Panic! At the Disco (3/25)
 - Roger Waters (6/10)
 - Arcade Fire (10/21)
 - Enrique Iglesias and Pitbull (10/28)
 - Jay-Z (12/16)
- Based on driveway counts, TNCs were estimated to be 9% of total vehicle use.
- Negligible use of other modes was observed accessing ballgames at the Coliseum.

Source: Fehr & Peers, BART, 2019.



Geographic distribution of attendees to the concerts differed from the baseball games, with a much higher percentage of concert attendees arriving from San Francisco BART stations and driving from San Francisco and the Oakland core and a much lower percentage of concert attendees using BART or driving from the Castro Valley and Dublin/Pleasanton areas. Using the existing distributions for these events, the same mode shift and geographic shift calculations were performed as described in the previous section. These events are projected to have 1,200 employees, with the same 15-percent drive mode share as for baseball games. The estimated Project 1.0 attendee mode split and trip generation (including employee trips) of these special events is presented in **Table 6**.

TABLE 6
PROJECT 1.0 HOWARD TERMINAL SPECIAL EVENT MODE SPLIT

Access Mode	Mode Share
Drive	57%
TNC	20%
Walk	4%
Bicycle	<1%
Ferry	<1%
Bus	1%
BART	18%
Total Vehicle Trips	22,800

Source: Fehr & Peers, 2019.

2.4 POTENTIAL TMP MEASURES FOR BALLPARK

This section presents the menu of options (or measures) that could be utilized in the TMP for the Howard Terminal Ballpark. Each measure would affect total vehicle trips at the ballpark differently for different game types and special events, depending on the mode share. Additionally, measures become increasingly effective when paired with other complementary measures, so aggregate effects are typically greater than effects in isolation. The measures presented in this memorandum are not meant to be requirements. Rather, they offer a menu of options available to the A's to achieve the AB 734 requirement of at least 20 percent VTR.



2.4.1 SUMMARY OF TMP MEASURES

This analysis only considers TMP measures that were quantifiable using the approach described previously. This does not imply that other measures not in this analysis do not have an impact on vehicle trips. Rather, those measures either may be difficult to model accurately under the framework used in this analysis or would be inappropriate to isolate in the absence of a wholistic transportation management strategy. The menu of analyzed measures follows five general strategies, as described in **Table 7** and listed below:

- Encourage Walking and Biking
- Better Transit Options
- Downtown Connections
- Parking Supply Management
- Reduced Vehicle / Trip Demand

TABLE 7
TMP MEASURES BY STRATEGY FOR BALLPARK VEHICLE TRIP REDUCTION

Strategy	Measures	Impacts
Encourage Walking and Bicycling	Develop Howard Terminal	Increases the number of people who may use active modes to access the ballpark.
	Valet Bicycle/Scooter Parking	
Better Transit Options	Special Event Ferries and Water Taxis	Shifts attendees towards transit by introducing new transit services or making existing services more attractive.
	Improved AC Transit Service	
Downtown Connections	BART Shuttles	Reduces TNC/driving mode share by providing an alternative to walking, improving the convenience and attractiveness of taking BART.
	Gondola	
Parking Supply Management	Reduce On-Site Parking Spaces	Reduces parking spaces available for attendees. Shifts attendee travel modes mostly towards BART (which reduces vehicle trips) and TNCs (which increase vehicle trips).
	Off-Site Garage Management	
	On-Street Parking Management	
Reduced Vehicle/ Trip Demand	Carpool Preference	Decreases the number of vehicles and trips demanded to serve the ballpark by reducing the attractiveness of high-trip TNCs and increasing private vehicle efficiency.
	TNC Management	

Source: Fehr & Peers, 2019.

Effectiveness of a suite of measures for each game type is assessed using the trip generation tool prepared for this memorandum. A description of the measures and how they affect the mode share and geographic distribution inputs to the model are below.



2.4.1.1 Encourage Walking and Bicycling

The following measures reduce vehicle trips by increasing the number of attendees who are likely to walk or bike to attend games or events at the ballpark.

Develop Howard Terminal

Developing the western side of Howard Terminal with residential and office buildings (among other uses) would increase the number of potential attendees within easy walking distance of the ballpark. Residents and workers in these buildings would walk or bicycle to attend baseball games or events at the ballpark. The development of Howard Terminal is expected to reduce the number of vehicle trips to the ballpark because it is anticipated that some of these residents and employees will walk to a ballgame instead of driving, as they would if they were not located in close proximity.¹ This measure would cause the geographic shift of attendees due to the ballpark's relocation to Howard Terminal to be more pronounced towards close-in attendees, and it is estimated that one percent of residents and workers at Howard Terminal would attend.

Valet Bicycle/Scooter Parking

Under Project 1.0, no special accommodations are made for attendees who choose to bicycle or scooter. As such, bicyclists and scooter riders must lock their bicycles and scooters to bike racks on the streets outside of Howard Terminal, which are limited in number and pose theft concerns.

This measure would provide a free bicycle and scooter valet parking service that could accommodate at least 500 bicycles or scooters, providing attendees who wish to bicycle or scooter to the ballpark a conveniently located, free, and secure place to store their bicycle or scooter while at the ballpark. By improving bicycling options, this measure reduces vehicle trips for attendees within five miles who otherwise may have chosen to use a TNC or drive themselves.

2.4.1.2 Better Transit Options

Improving transit options, either by introducing new services specially tailored to ballpark events, optimizing existing services, or reducing the cost of transit can have a moderate impact on vehicle trips by inducing some attendees to forgo driving.

¹ Vehicle trips of these residents and employees unrelated to ballpark travel are not considered part of the ballpark's trip generation. Vehicle trip reduction strategies for these non-ballpark land uses are analyzed in Section 3 of this memorandum.



Ballpark Gameday/Event Ferries and Water Taxis

Under Project 1.0, ferry service at the Oakland Jack London Square ferry terminal is poorly timed to accommodate game attendees, except for those who want to arrive via ferry for weekday evening games and then use a different mode when departing. However, as the San Francisco Giants do for their home games, it is possible to organize special gameday ferries with WETA, the Golden Gate Ferry, or a private operator. Howard Terminal's location on the waterfront lends itself to these ferries because of the short distance between the ferry terminal and the ballpark.

This measure would consider special event ferry service to Oakland from San Francisco, Richmond, Vallejo, or elsewhere. Water taxis between Oakland and Alameda are also potential options depending on ballpark attendee preferences, as determined through surveys. These services would operate similarly to the San Francisco Giants service, arriving about 20 minutes before the start of the game or event and departing about 20 minutes after the final out or end of the event. Because of the proximity of the Oakland and Alameda ferry terminals, water taxi service could have multiple runs before and after a game or special event. This measure would induce more attendees from the Alameda, San Francisco, Richmond, and Vallejo areas to use the ferry.

The total increase in ferry ridership was calibrated to model one San Francisco-Oakland ferry, one Richmond-Oakland ferry, and water taxi service equivalent to one smaller ferry between Oakland and Alameda. An increase in ferry ridership from San Francisco would not affect the number of vehicle trips (riders within walking distance of the Ferry Building would otherwise use BART), but riders from Alameda, Richmond and Vallejo areas switching from vehicles to the ferry would result in a reduction in vehicle trips.

Improved AC Transit Service

Under Project 1.0, AC Transit serves the Howard Terminal site, with only Line 72/72M/72R offering high-frequency service with stops within a quarter mile of the site. Except for the Broadway Shuttle on weekdays which is about one-third of a mile from the site, other routes with high-frequency service require a 20- to 25-minute walk to the ballpark.

This measure improves AC Transit service to the project site by bringing the Lines 6, 72/72M/72R, and Broadway Shuttle bus stops to 2nd Street between Martin Luther King Jr Way and Washington Street, adjacent to the Martin Luther King Jr Way corridor pedestrian access to the ballpark. It would also adjust or extend the Lines 29 and 36 buses to stop in the same area while traveling between the West Oakland and Lake Merritt BART stations, and provide transit-only lanes on one or more of the routes used by these lines to improve travel time and reliability. This measure would moderately increase bus ridership to the games, with the size of the effect estimated to be an



increase of several full busloads of attendees. Overall, the size of the effect was moderate based on the number of attendees who might plausibly switch to bus service to travel to and from the ballpark.

2.4.1.3 Downtown Connections

Under Project 1.0, attendees who use BART to travel to or from the ballpark must walk about 20 minutes between BART stations and Howard Terminal. This dramatically decreases the time competitiveness of BART compared to vehicles, particularly considering that travel time spent walking is generally viewed as less preferable than travel time spent on other modes. Likewise, workers and residents in Downtown and Uptown Oakland face potentially longer walks to the ballpark if they originate north of 12th Street, and the use of TNCs for these attendees to access the ballpark in the absence of alternative options is likely. Better connections between Downtown Oakland and the ballpark would reduce vehicle trips by increasing the attractiveness and convenience of BART and providing a reasonable alternative for downtown workers and residents.

BART Shuttles

This measure introduces a shuttle system between the 12th Street Oakland City Center BART station and Howard Terminal. The measure could be expanded to include shuttle service between West Oakland BART and Howard Terminal, as well as Lake Merritt BART and Howard Terminal. Shuttle service would not only increase BART ridership by increasing convenience, but also increase walking mode share, as attendees within walking distance of the shuttle stops could walk to the shuttle to take it to Howard Terminal. The shuttle service would determine optimal routing and service requirements based on attendee preferences (as captured by surveys) in coordination with the City of Oakland and service provider.

This measure primarily reduces vehicle trips by encouraging more attendees within a moderate distance of Downtown Oakland to use BART or walk instead of switching to TNCs. The West Oakland and Lake Merritt shuttles have a smaller effect as the 12th Street shuttle because BART riders who wanted to use the shuttles already would have been able to do so at 12th Street.

The VTR impact of BART shuttles is moderate and relatively unaffected by the implementation of other measures. The impact is moderate because while these shuttles encourage mode shift primarily away from TNCs (which have the largest vehicle trip impact), they have a capacity of only about 2,200 riders per hour, much less than the peak-hour attendee BART ridership. This means that they would likely not serve all BART riders and downtown workers and residents who may want to use them. Additionally, shuttles would not be able to drop off on-site, meaning that overall travel



times would only be reduced by up to 5 minutes, though riders would still not have to walk the full distance between BART and the ballpark.

BART shuttles have relatively limited synergies with other measures because shuttles do not cause much of a mode shift for attendees who currently drive from outside of Oakland. Even with shuttles, the location of Howard Terminal is still less convenient to BART than is the Coliseum site. If an attendee currently drives to the Coliseum, they are likely to continue to drive to Howard Terminal.

Gondola

As an alternative to a shuttle between the 12th Street Oakland City Center BART station and the ballpark at Howard Terminal, a gondola could be provided that would transfer attendees between the two locations. The gondola's capacity of 6,000 riders per hour would serve most or all attendees using BART, even during the peak post-game hour. The gondola would also provide a faster travel time than the shuttle reducing overall travel time by up to 10 minutes compared to walking.

The impact of the gondola would have a similar effect as the BART shuttles on what kinds of attendee behavior would be affected, but the size of the effect would be larger due to its greater capacity and convenience.

2.4.1.4 Parking Supply Management

The new ballpark would provide 6,800 parking spaces under Project 1.0, and drivers were estimated to be willing to walk about 20 minutes (or one mile) from a parking space to the ballpark. Within that radius, there are about 4,600 available off-site spaces (in garages and on-street) for weekday evening games and 2,700 available off-site spaces for weekday day games. Weekend games were estimated to have the same number of available off-site parking spaces as weekday evening games. Under Project 1.0, there would be enough on- and off-site spaces to accommodate all attendees who would prefer to drive.

Measures that reduce the available parking to attendees reduces the number of vehicle trips by physically constraining the number of attendee vehicles that can be parked within a reasonable distance of the ballpark. To model this effect, attendees who would prefer to drive and park in excess of the number of available on- and off-site spaces were assigned instead to their second-choice mode. Attendees with the greatest likelihood to shift to a second-choice mode due to limited parking availability are those driving from relatively nearby and drivers with an origin near a BART station. Drivers greater than five miles away and not proximate to a BART station would be less likely to switch modes if parking supply were constrained.



To assess the relative sizes of these groups, the number of drivers between two and five miles of Howard Terminal was compared to the number of drivers within about two miles of BART stations outside of the Oakland core. After factoring in previous mode and geographic shifts, about 75% of the pool of drivers with convenient second options were those near BART stations. Therefore, 75% of attendees who were no longer able to drive to the ballpark were estimated to switch to BART, with most of the others switching to TNCs.

Reduced On-Site Parking Spaces

Under Project 1.0, Howard Terminal provides 6,800 parking spaces for ballpark attendees to use. This measure would restrict the number of available parking spaces to 3,500. The primary impact of this measure would be to increase the number of displaced vehicles, thereby shifting those attendees' modes mostly towards BART and TNCs.

This measure has the largest VTR impact of any of the identified strategies, as it directly and dramatically reduces the number of attendees who drive to the game. The trip reduction effect of this strategy, however, is tied to the mode choice of those displaced drivers, since attendees who switch from driving to TNCs double their number of vehicle trips. Therefore, this strategy is most effective when paired with other strategies that reduce the appeal of TNC use.

In addition, this measure is most effective for high-attendance events where the potential parking demand is greatest. Lower-attendance events would need fewer parking spaces provided to have the same effect.

Off-Site Garage Management

Within one mile of Howard Terminal, there are approximately 8,300 parking spaces in off-site garages, of which 2,900 are available at 1:00 PM on weekdays and 3,300 are available at 7:00 PM on weekdays. Under Project 1.0, all the currently available spaces would be used by ballpark attendees, as garage operators independently maximize garage occupancy. This TMP measure implements parking management measures, such as parking management agreements and pricing, to maintain an 95% occupancy rate of the off-site garages. This would reduce effective parking supply by about 400 spaces while increasing revenue per parked vehicle.

As with the other parking supply management measures, this measure is most effective for high-attendance events and when paired with other strategies to reduce parking supply and discourage TNC use.



On-Street Parking Management

Under Project 1.0, on-street parking restrictions continue to operate as they currently do, with a mix of free parking, paid parking, and two- or four-hour time restrictions, all of which end at 6:00 PM. Within one mile of Howard Terminal, there are roughly 4,700 on-street parking spaces, of which 1,300 are available at 1:00 PM on weekdays and 2,300 are available at 7:00 PM on weekdays. This TMP measure implements parking management measures, potentially including variable pricing, expanding and extending time restrictions, and residential parking permit programs. For on-street parking spaces open to the public during ballgames, this measure would target an 85% occupancy rate. Parking spaces near the ballpark could have parking prohibited except to residents or local businesses. This would reduce effective parking supply for ballpark attendees by up to 1,800 spaces.

By reducing the effective parking supply, some attendees who otherwise would have driven would switch to other modes. The effectiveness of this measure depends on the overall supply of parking being a binding constraint. This measure will have little effect if parking supply is greater than parking demand, and it therefore should be paired with other measures that reduce the parking supply to get the most VTR.

2.4.1.5 Reduced Vehicle/Trip Demand

Another way measures approach VTR reductions is to reduce the demand for vehicle trips. This can happen either by reducing the number of vehicles (and therefore trips) used to serve a given number of people by increasing occupancies, or by discouraging vehicle trips through making the use of automobiles a less convenient option for attendees.

Carpool Preference

Under Project 1.0, all vehicles are given equal priority to park at Howard Terminal, regardless of vehicle occupancy. Field observations of entering vehicles indicate that around 20% of vehicles arriving to the Coliseum on gamedays contain four or more occupants, with an overall average of 2.41 attendees per vehicle.¹ If the most convenient spaces were reserved for carpools with four or more occupants, attendees would increase the number of people they transport in each vehicle, resulting in an increased average vehicle occupancy. If 30 percent of the parking spaces on Howard Terminal were reserved for vehicles with four or more occupants, and these spaces were filled, the average vehicle occupancy would increase from 2.41 to 2.52 people per vehicle.

¹ Vehicle occupancy data was taken at the main gate of the Coliseum during the two hours prior and half-hour following the start of the A's home game on September 8, 2018 and then adjusted to account for the drivers of TNC vehicles.



This measure is one of the few that is most effective when the parking supply is not a limiting factor on the number of attendees who drive and park. With unconstrained parking conditions, the increase in average vehicle occupancy directly decreases the number of vehicles driving to the ballpark. The measure still has an impact under constrained parking conditions by reducing the number of displaced drivers, some of whom would have used a TNC otherwise. This measure would continue to be effective in low-attendance situations.

TNC Management

Under Project 1.0, a large percentage of ballpark attendees would use TNCs to access Howard Terminal. This is problematic in terms of vehicle trips, as an attendee who uses TNCs contributes twice as many trips compared to an attendee who drives their personal vehicle. In part, this high mode share is driven by the fact that while Howard Terminal is near downtown (and therefore near many potential attendees), it is nonetheless located a 20-minute walk away from the site. This causes fewer people to prefer to walk or find some other non-vehicular mode of transportation when an inexpensive alternative is provided in the form of TNCs.

This measure places a TNC geofence extending approximately 0.5 miles from the ballpark in all directions around the start and end times of baseball games and events. Physical barriers and traffic control officers would provide enforcement of the geofence to make it difficult for TNCs to operate except in the proscribed manner. On-site and designated off-site TNC pick-up/drop-off zones may be available, which on its own would likely increase TNC capacity compared to no designated TNC zones.

However, TNC use of these designated zones could be priced at a premium using a TNC fee calibrated to reduce demand. This measure makes TNC use less convenient and more expensive, shifting people towards other modes with fewer or no associated vehicle trips. This measure has the greatest reduction effect on TNC users in the closest-in areas because there are multiple alternative options, including walking, bicycling, and shared micro-mobility. Areas approaching five miles out and further, by contrast, would experience relatively less impact because there are fewer convenient alternatives to TNC use.

The overall impact of this measure is large because those attendees whose behavior it changes have a disproportionate impact, as TNC users who switch to zero-trip modes have twice the trip reduction impact of drivers who switch to zero-trip modes. This measure is particularly powerful when paired with parking reduction strategies, as it incentivizes displaced drivers to use BART or other modes rather than counterproductively (from a VTR perspective) switching to TNCs.



2.5 BALLPARK PROJECT 2.0

To meet the requirements to qualify for certification under AB 734, the Howard Terminal Ballpark must implement a TMP that achieves a vehicle trip reduction of 20 percent compared to Project 1.0 without the program. Although the components of this program have not been finalized, they will draw from the menu of TMP options presented in the previous section (Section 1.4). From the full list of measures, the following are preferred:

- Provide free bicycle and scooter parking with security oversight and the ability to serve 500 bicycles and scooters.
- Move bus stops to provide high-frequency AC Transit service adjacent to the ballpark.
- Provide free shuttle service between the ballpark and the 12th Street, West Oakland, and Lake Merritt BART stations.
- Manage parking supply, with the following strategies used for modeling purposes:
 - Reduce the number of on-site ballpark parking spaces from 6,800 to 3,500.
 - Manage the parking supply of nearby off-site garages using management agreements to maintain an occupancy rate of no more than 95%.
 - Manage parking supply of nearby on-street spaces using pricing, extended enforcement hours, and/or time restrictions to maintain an occupancy rate of no more than 85%.
 - Expand residential parking programs in West Oakland and Downtown Oakland
- Reserve a portion of the closest on-site parking spaces for vehicles with 4+ occupants
- Manage TNC operations by constructing a geofence near the ballpark before and after baseball games and large events for transportation network company (TNC) vehicles, with a TNC fee rationing access to the pick-up/drop-off zones on-site and nearby off-site. Physical barriers and traffic control officers would enforce the geofence area.

This memorandum uses one potential mix of measures that achieves a 20 percent VTR, defined as Project 2.0, but the final suite of measures is subject to change. For the purposes of this memorandum, Project 2.0 is treated as consisting of the following measures:

- Managed Parking Supply
- TNC Management
- Bicycle and Scooter Parking



2.5.1 BALLPARK PROJECT 2.0 MODE SHARE, TRIP GENERATION, AND VTR

The process described previously in this memo was used to estimate attendee mode choice for baseball games and concerts under Project 2.0. The estimated arrival mode share of attendees for each type of baseball game and concerts is presented in **Table 8**.

TABLE 8
PROJECT 2.0 BALLPARK ATTENDEE ARRIVAL MODE

Scenario	Weekday Evening	Weekday Day	Weekend	Concert
Drive	48%	34%	48%	59%
TNC	13%	16%	14%	11%
Walk	4%	3%	2%	4%
Bike	1%	2%	1%	2%
Ferry	1%	<1%	<1%	<1%
Bus	2%	2%	1%	2%
BART	32%	42%	33%	22%

Source: Fehr & Peers, 2019.

BART mode share under Project 2.0 is estimated to be higher than existing conditions at the Coliseum despite the longer walking distance between the nearest BART station and the ballpark at Howard Terminal because the introduction of the TMP makes automobile modes of travel also less convenient than they are at the Coliseum. For example, the measure limiting the number of parking spaces available for personal vehicles means that many drivers would have to walk long distances from off-site parking garages. Similarly, the measure that manages TNC operations with a fee and geofence means that potential users would have to either pay premium pricing or walk a long distance. The vehicle trip generation estimates and associated VTR for baseball games and concerts are presented in **Table 9**.



TABLE 9
BALLPARK VEHICLE TRIP GENERATION AND VTR

Scenario	Weekday Evening ¹	Weekday Day ¹	Weekend ¹	Concert ^{2, 3}	Weighted Average ⁴
Project 1.0	27,300	27,800	28,600	22,800	27,300
Project 2.0	21,900	20,100	22,600	19,300	21,600
VTR	20%	28%	21%	15%	21%

Notes:

1. Includes 35,000 attendees and 1,320 employees
2. Includes 28,000 attendees and 1,200 employees
3. The concert venue trip generation can be adjusted based on attendance and staff to represent the other smaller events, corporate / community events, and plaza events anticipated to be held at the ballpark.
4. Weighted average calculated based on 41 weekday evening games, 14 weekday day games, 27 weekend games, and 9 concerts.

Source: Fehr & Peers, 2019.

2.5.2 ESTIMATED VTR ASSOCIATED WITH VARIOUS BALLPARK TMP MEASURES

Measures included in Project 2.0 are not finalized, and some assessed as part of this analysis may be removed, while others from the menu, described in Section 2.4, may be added. **Table 10** presents the estimated VTR of categories of measures discussed in this memorandum, with estimates provided in the context of the Project 2.0 defined for this memorandum.

VTR estimates for measures that are included in Project 2.0 represent how much less VTR would be achieved without that measure for baseball games, and VTR estimates for measures that are not included in Project 2.0 represent how much additional VTR would be achieved with that additional measure. The estimates in **Table 10** are presented as ranges because the VTR impact of the TMP measures would vary depending on the specific measures included from each category.

Weekday midday games would have a substantially larger reduction in personal automobile trips than the other game types because there are fewer off-site parking spaces available for ballpark users in the middle of the day, when they are used by workers in Downtown Oakland. **Table 11** presents the combined available on- and off-site parking supply and ballpark parking demand for each game type under Project 2.0.



TABLE 10
DESCRIPTION OF BALLPARK TMP MEASURES AND VTR ESTIMATE

TMP Category	TDM Measures	VTR Estimate¹
Encourage Walking and Bicycling	Develop Howard Terminal with high-density housing and office uses	0-2%
	Provide a free bicycle/scooter valet parking service for at least 500 bicycles and scooters	
Better Transit Options	Gameday special event ferries between the Oakland Jack London Square ferry terminal and San Francisco, Alameda, Richmond, and/or Vallejo	1-10%
	Move bus stops to provide high-frequency AC Transit service adjacent to the ballpark	
	Provide transit reimbursement equivalent to one roundtrip fare on AC Transit included in the ticket price	
Downtown Connections	Gameday shuttles between 12th Street BART station and the ballpark	2-6%
	Additional gameday shuttles between West Oakland and Lake Merritt BART stations and the ballpark	
	Gondola service between 12th Street and the ballpark	
Parking Supply Management	Reduce the number of on-site parking spaces available for ballpark attendees to 3,500	0-11%
	Use pricing to maintain an 95% occupancy rate at nearby off-site garages	
	Use pricing to maintain an 85% occupancy rate at nearby on-street spaces	
	Prohibit on-street parking by ballpark attendees near the ballpark	
Reduced Vehicle/ Trip Demand	Expand residential parking programs in West Oakland and Downtown Oakland	3-14%
	Reserve a portion of the closest on-site parking spaces for vehicles with 4+ occupants	
	Manage TNC operations by constructing a geofence near the ballpark before and after baseball games and large events for TNC vehicles. Enforce the geofence area via physical barriers and traffic control officers.	
	Implement a TNC fee rationing access to the pick-up/drop-off zones on-site and nearby off-site.	

1. VTR estimate is calculated for baseball games at full attendance.

Source: Fehr & Peers, 2019.



TABLE 11
PARKING AVAILABILITY AND DEMAND DURING BALLGAMES UNDER PROJECT 2.0

	Project 2.0		
	Evening	Midday	Weekend
Available Parking ¹	6,900	5,000	6,900
Parking Demand ²	8,900	8,900	9,700
Displaced Vehicles ³	2,000	3,900	2,800
Shifted Drive Attendees ⁴	4,800	9,300	6,600

1. Includes on-site garage and available spaces in on-street and off-site garages within one mile of the ballpark
2. The estimated number of vehicles that would prefer to drive and park if a parking space was available
3. Number of vehicles with attendees who would not be able to find available parking within one mile of the ballpark
4. Using the observed average occupancy of 2.41

Source: Fehr & Peers, 2019.

While there are enough available parking spaces near the ballpark to accommodate all who want to drive and park under Project 1.0 (making the supply difference between the time periods irrelevant), the parking supply reductions in Project 2.0 mean that not all who want to drive and park would be able to find a parking space near the ballpark. Parking supply therefore limits the number of attendees who can drive and park depending on different levels of availability between games. This directly varies the effectiveness of the managed parking supply measure, but it also means that other measures that affect the mode choice decision of non-drivers (like TNC management) affect a different number of attendees depending on game type.

3 NON-BALLPARK DEVELOPMENT

On the western side of Howard Terminal, the project would eventually displace the surface parking that would be provided on opening day of the ballpark with a multi-block mixed-use development that includes residential, office, retail, restaurant, and hotel land uses. As with the eastern side of the site, the western side is currently used to support operations at the Port of Oakland, with truck parking, container storage, and longshoreman training and administration. Up to 3,000 multifamily residential dwelling units, 1.564 million square feet of office-related space, 270,000 square feet of retail and restaurant space, 400 hotel rooms, and a 3,500-seat performance theater could be developed. Like the Howard Terminal Ballpark analysis, Project 1.0 is defined as building the project at Howard Terminal before any TMP or TDM measures are implemented and when all vehicle demand is met. It does, however, reflect the site's mix of uses and proximity to transit and complimentary land uses. Project 2.0 implements measures to achieve a VTR of 20 percent or more.



3.1 PROJECT 1.0 TRIP GENERATION

Per City of Oakland guidelines for the non-ballpark development land uses, trip generation estimates for Project 1.0 were established using trip generation data published by the Institute of Transportation Engineers (ITE) in the *Trip Generation Manual (10th Edition)* as a starting point. The residential units were treated as being in high-rise apartment buildings of more than 10 floors. Although the performance venue would only be in use roughly 100 days per year, it is included in these calculations to present trip generation on days where all land uses are operating. Trip generation for the performance venue was estimated using the methodology for special events at the ballpark for a 3,500-attendee event with 200 employees. **Table 12** summarizes the Project 1.0 trip generation for the proposed project.

Although the ITE trip generation rates account for pedestrian, bicycling, and transit trips, ITE data is generally based on single-use suburban sites, and the methodology tends to overestimate the automobile trip generation for mixed-use developments located in urban environments with surrounding pedestrian, bicycle, and transit infrastructure. Given the Howard Terminal site's proximity to multiple high-frequency transit nodes (including the 12th Street Oakland City Center BART station and West Oakland BART station, both about 0.9 miles away), existing and planned pedestrian and bicycle infrastructure, and density and mix of land uses included in the project and in the surrounding neighborhoods, it is likely that a substantial percentage of trips generated by the project will utilize modes other than an automobile.

This analysis, therefore, reduces the ITE-based trip generation by about 37 percent to account for non-automobile trips. This reduction is consistent with the City of Oakland's revised Transportation Impact Review Guidelines (TIRG) published on April 14, 2017, which guide the evaluation of transportation impacts associated with land use development projects in the city. The reductions established in the City of Oakland TIRG are based on US Census commute data for Alameda County from the 2014 5-Year Estimates of the American Community Survey (ACS), which shows that the non-automobile mode share for areas between 0.5 miles and 1.0 miles from a BART Station is about 37 percent.¹

¹ The TIRG considers ferry terminals as well as rail stations in its analysis, and the Jack London Square Ferry Terminal and Amtrak Station are within 0.5 miles of the project site. However, due to the scale of the project compared to the capacity of the ferry and rail service, this memo also considers BART and uses 0.5 to 1.0 miles as the distance category to apply from the TIRG.



TABLE 12
HOWARD TERMINAL NON-BALLPARK DEVELOPMENT PROJECT 1.0
AUTOMOBILE TRIP GENERATION

Land Use	ITE Code	Size ¹	Daily Trips		
			Weekdays	Saturdays	Sundays
Residential ²	222	3,000 DU	12,000	12,400	9,800
Office ³	710	1,564 KSF	15,300	3,500	1,100
Retail ⁴	820	180 KSF	9,000	12,800	5,900
Restaurant ⁵	932	90 KSF	10,100	11,700	11,700
Hotel ⁶	310	400 rooms	4,100	3,600	2,900
ITE Trip Generation Subtotal			50,500	44,000	31,400
Non-Auto Reduction ⁷			-18,500	-16,100	-11,500
Performance Venue ⁸	-	3,500 seats	2,900	2,900	2,900
Adjusted Total Project 1.0 Auto Trips			34,900	30,800	22,800

Notes:

1. DU = Dwelling Units, KSF = 1,000 square feet.
2. ITE *Trip Generation (10th Edition)* land use category 222 (High-Rise Apartment):
Weekdays: $T = 3.94 * X + 211.81$
Saturdays: $T = 4.08 * X + 185.69$
Sundays: $T = 3.21 * X + 156.83$
3. ITE *Trip Generation (10th Edition)* land use category 710 (General Office Building):
Weekdays: $\ln(T) = 0.97 * \ln(X) + 2.5$
Saturdays: $T = 2.21 * X$
Sundays: $T = 0.7 * X$
4. ITE *Trip Generation (10th Edition)* land use category 820 (Shopping Center):
Weekdays: $\ln(T) = 0.68 * \ln(X) + 5.57$
Saturdays: $\ln(T) = 0.62 * \ln(X) + 6.24$
Sundays: Fitted rate not available. Ratio of average rates between Saturday and Sunday (46.12 for Sat, 21.10 for Sun) applied to Saturday trip generation.
5. ITE *Trip Generation (10th Edition)* land use category 932 (High Turnover (Sit-Down) Restaurant):
Weekdays: $T = 11.29 * X - 426.97$
Saturdays and Sundays: $T = 130.5 * X$ (weighted average of ITE Saturday and Sunday rates used due to small sample sizes)
6. ITE *Trip Generation (10th Edition)* land use category 310 (Hotel):
Weekdays: $T = 11.29 * X - 426.97$
Saturdays: $T = 9.62 * X - 294.56$
Sundays: $T = 8.56 * X - 538.12$
7. Reductions of 36.7% estimated for ITE rates, based on City of Oakland *Transportation Impact Review Guideline*, using Census data for urban environments between 0.5 and 1.0 miles from a BART station, Ferry Terminal and rail station.
8. Trip generation for the performance venue was derived using the same methodology as special events at the ballpark for a 3,500-attendee event with 200 employees.

Source: Fehr & Peers, 2019.



An additional trip generation reduction for pass-by trips (trips attracted to the project site from adjacent roadways as an intermediate stop on the way to some other final destination) was not applied to the retail component of this analysis because the Howard Terminal site's location on the waterfront has limited connection to external roadways supporting pass-by trips.

As summarized in Table 12, the net new daily automobile trip generation for the non-ballpark development project in the Project 1.0 would be approximately 34,600 on weekdays, 30,400 on Saturdays, and 22,500 on Sundays.

3.1.1 PROJECT 1.0 AUTOMOBILE OWNERSHIP AND USE

As a working Port property, Howard Terminal does not currently have zoning standards for residential, office, or retail uses. The project will zone the site for these uses, including setting either parking minimums or maximums. Under Project 1.0, the Howard Terminal developments would implement parking standards consistent with market demand in nearby neighborhoods with similar land uses.

3.1.1.1 Residential

Automobile use at residential locations is a function of the number of automobiles available for household to use, as well as demographic composition of residents, mix of nearby land uses, and convenience of other transportation options. Based on US Census data, **Table 13** summarizes vehicle ownership for households with employed residents in the census tract adjacent to Howard Terminal in Jack London District bounded by Martin Luther King Jr Way, and 5th and Alice Streets.

TABLE 13
EXISTING VEHICLE OWNERSHIP FOR EMPLOYED RESIDENTS

Vehicles Available	Percent of Households with Employed Residents
No vehicle available	4%
1 vehicle available	56%
2 vehicles available	37%
3 or more vehicles available	3%
Average Vehicles per Household	1.4

Source: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates, Alameda County Census Tract 9832, Table B08203; Fehr & Peers, 2019.



This census tract has similar demographics as anticipated at Howard Terminal, a similar mix of nearby land uses, and a somewhat closer proximity to transit. Table 13 presents a conservative estimate of the likely rate of vehicle ownership of Howard Terminal residents in Project 1.0 where no additional TDM measures are put in place. According to this data, the average household in this tract owns 1.4 vehicles, which is used as the estimate of Project 1.0 residential parking demand.

3.1.1.2 Office

Automobile use at offices is a function of the availability of parking, as well as the type of employment, demographics of the workers, and convenience of other transportation options. Based on US Census data, **Table 14** summarizes mode share for workers commuting to the Downtown Oakland and Jack London District census tracts bounded by Martin Luther King Jr Way, 14th Street, and Alice Street. The table also presents the vehicle trips and parking demand per worker for each commute mode and calculates the overall rates of each for these census tracts.

TABLE 14
EXISTING COMMUTE MODE OF TRAVEL, VEHICLE TRIPS, AND PARKING DEMAND

Mode	Mode Share	Daily Commute Vehicle Trips per Worker	Parking Demand per Worker
Drive Alone	57%	2	1
2-person Carpool	8%	1	0.5
3-person Carpool	2%	0.67	0.33
Bus	6%	0	0
BART	18%	0	0
Ferry	2%	0	0
Bike	2%	0	0
Walk	4%	0	0
Taxi	1%	4	0
Total	100%	1.3	0.6

Source: U.S. Census Bureau, 2006-2010 Census Transportation Planning Products 5-Year Data Set, Alameda County Census Tracts 4030, 4031, and 9832, Table B206200C; Fehr & Peers, 2019.



While types of employment and demographics of workers at Howard Terminal are anticipated to be like those in Downtown Oakland, downtown has greater transit accessibility. As such, Table 14 presents a lower-bound estimate of the Project 1.0 parking demand and commute vehicle trips per worker for office uses at Howard Terminal. According to this data, the average worker in these tracts has parking demand of 0.6 spaces and is responsible for 1.3 automobile commute trips. With an average square footage per worker of 225 (including lobbies and common areas), parking demand for the Project 1.0 office component is about 2.7 spaces per thousand square feet.

3.1.1.3 Retail and Restaurant

While types of employment and demographics of workers at Howard Terminal are anticipated to be like those in Downtown Oakland, downtown has greater transit accessibility. As such, Table 14 presents a lower-bound estimate of the Project 1.0 parking demand and commute vehicle trips per worker for office uses at Howard Terminal. According to this data, the average worker in these tracts has parking demand of 0.6 spaces and is responsible for 1.3 automobile commute trips. With an average square footage per worker of 225 (including lobbies and common areas), parking demand for the Project 1.0 office component is about 2.7 spaces per thousand square feet.

Parking demand for retail and restaurant components of the development was derived using data from ITE's *Parking Generation (4th Edition)*, which estimates hourly parking demand for each land use type by day of the week and, for retail uses, month of the year. These uses would share the same parking spaces. Using the square footages provided for each use, combined hourly parking demand for these uses was estimated for non-Friday weekdays, Fridays, Saturdays, and Sundays, for non-December months and December. Under Project 1.0, enough parking would be provided for retail and restaurant uses to meet parking demand at the busiest time of year, which would represent a parking ratio of about 5.6 spaces per thousand square feet.

3.1.1.4 Hotel

Data regarding parking demand for hotel uses in the project area is not readily available. Oakland's municipal code (section 17.116.060) requires a minimum of 0.5 spaces per room for hotels in most of the city, including in the Jack London District bordering Howard Terminal. This requirement is therefore estimated to represent parking demand for hotel uses in the absence of TDM measures.

3.1.1.5 Performance Venue

Parking demand at the performance venue can be derived for a sold-out event with 200 employees using the methodology used to estimate special event trip generation at the ballpark. Using these estimates, 800 parking spaces would be needed under Project 1.0 where all parking demand is met.



3.2 PROJECT 2.0 TDM PROGRAM COMPONENTS

To meet the requirements of AB 734, Howard Terminal project must implement a TMP or TDM program for non-ballpark development that achieves vehicle trip reduction of 20 percent compared to Project 1.0 without TDM program. Defined as Project 2.0, the TDM program for the non-ballpark development component of the project will include three components:

- Reduced Parking Supply
- Physical Improvements
- On-Going Operational Strategies

The rest of this section describes these components in detail.

3.2.1 REDUCED PARKING SUPPLY

The primary driver of trip reductions in Project 2.0 for the non-ballpark development at Howard Terminal is a substantial reduction in the allowable parking supply compared to Project 1.0, which allowed for a similar amount of parking as demanded in neighboring areas. This TDM measure achieves VTR by physically restricting the number of vehicles that can be parked and stored at Howard Terminal, forcing some residents, office workers, and retail/restaurant customers to choose other modes who otherwise would have driven a vehicle.

Parking maximums would apply to residential, office, and retail/restaurant components that are substantially lower than existing demand, and no parking minimums would be applied. For the hotel, parking would be capped at the estimated current level of parking demand, and the performance venue would not provide any additional parking of its own and would share with the ballpark. While maximums set at the level of existing demand would not induce VTR, they would help ensure that vehicle trips for these uses do not exceed Project 1.0 estimated trip generation. **Table 15** presents Project 1.0 level of parking demand for each of the non-ballpark development land uses at Howard Terminal, as well as the parking maximum instituted by Project 2.0.

3.2.2 PHYSICAL IMPROVEMENTS

Under Project 2.0, the development at Howard Terminal would also implement physical improvements that encourage the use of non-automobile modes. These elements are derived from the TDM strategies outlined in City of Oakland's TIRG.



TABLE 15
PROJECT 2.0 PARKING MAXIMUMS

	Residential	Office	Retail and Restaurant	Hotel	Performance Venue¹
Project 1.0 Parking Demand	1.4 per DU	2.7 per KSF	5.6 per KSF	0.50 per room	-
Project 2.0 Parking Maximum	1.0 per DU	2.0 per KSF	2.6 per KSF	0.50 per room	-

1. Performance venue parking would be shared with the ballpark

Sources: U.S. Census Bureau, 2012-2016 American Community Survey 5-Year Estimates, Alameda County Census Tract 9832, Table B08203; 2006-2010 Census Transportation Planning Products 5-Year Data Set, Alameda County Census Tracts 4030, 4031, and 9832, Table B206200C; City of Oakland; Fehr & Peers, 2019.

Many of the TDM elements described by the TIRG are focused on improving existing transportation facilities. As this project would be building the internal roadway network from scratch, these elements would guide development of the facilities provided on these roadways. The City of Oakland's physical TDM strategies are presented in **Table 16**, along with their applicability to the Howard Terminal project. Because the impact of these TDM measures have not been quantified, no VTR reductions from these measures have been applied, thereby presenting a conservative analysis.

TABLE 16
APPLICATION OF CITY OF OAKLAND TDM PROGRAM COMPONENTS

TDM Strategy	Required When	Applied to the Proposed Project?
Bus boarding bulbs or islands	<ul style="list-style-type: none"> A bus boarding bulb or island does not already exist, and a bus stop is located along the project frontage; and/or bus stop along project frontage serves a route with 15 minutes or better peak hour service and has a shared bus-bike lane curb 	Yes , bus stop facilities would be provided on Second Street adjacent to the site and accommodation designed into the project site
Bus shelter	<ul style="list-style-type: none"> A stop with no shelter is located within the project frontage, or The project is located within 0.10 miles of a flag stop with 25 or more boardings per day 	Yes , bus shelters would be provided at new bus stops on Second Street adjacent to the site and on the project site
Concrete bus pad	<ul style="list-style-type: none"> A bus stop is located along the project frontage and a concrete bus pad does not already exist 	Yes , concrete bus pads would be provided at new bus stops on Second Street adjacent to the site and on the project site
Curb extension / bulb-outs	<ul style="list-style-type: none"> Identified as an improvement within site analysis 	Yes , bulb-outs would be provided on-site with on-street parking



TABLE 16
APPLICATION OF CITY OF OAKLAND TDM PROGRAM COMPONENTS

TDM Strategy	Required When	Applied to the Proposed Project?
Implementation of a corridor-level bikeway improvement	<ul style="list-style-type: none"> • A buffered Class 2 or Class 4 bikeway facility is in a local or county adopted plan within 0.10 miles of the project location; and • The project would generate 500 or more daily bicycle trips 	<p>Yes, project would construct Class 2 bike lanes on Market Street connecting the site to 3rd Street, Class 2 bike lanes on 3rd Street connecting to Martin Luther King Jr Way, Class 2 bike lanes on Martin Luther King Jr Way connecting 2nd and 3rd Street, Class 2 bike lanes on 2nd Street connecting to Jefferson Street and a bicycle and pedestrian railroad over crossing to the site.</p>
Implementation of a corridor-level transit capital improvement	<ul style="list-style-type: none"> • A high-quality transit facility is in a local or county adopted plan within 0.25 miles of the project location; and • The project would generate 400 or more peak period transit trips 	<p>Yes, project would upgrade transit stops nearest the project for Line 72/72M/72R through coordination with AC Transit and Oakland</p>
Install pedestrian amenities such as lighting; green infrastructure, trees, or other greening landscape; trash receptacles per the Pedestrian Master Plan and applicable streetscape plan	<ul style="list-style-type: none"> • Always required 	<p>Yes, project would install pedestrian amenities at the site</p>
Installation of safety improvements identified in the Pedestrian Master Plan (such as crosswalk striping, curb ramps, count down signals, bulb outs, etc.)	<ul style="list-style-type: none"> • When improvements are identified in the Pedestrian Master Plan along project frontage or at an adjacent intersection 	<p>Yes, project would provide pedestrian improvements, including railroad safety improvements</p>
In-street bicycle corral	<ul style="list-style-type: none"> • A project includes more than 10,000 square feet of ground floor retail, is located along a Tier 1 bikeway, and on-street vehicle parking is provided along the project frontages. 	<p>Yes, in-street bicycle corrals would be provided on-site that meet these criteria</p>
Intersection improvements, including but not limited to visibility improvements, shortening corner radii, pedestrian safety islands, accounting for pedestrian desire lines.	<ul style="list-style-type: none"> • Identified as an improvement within site analysis 	<p>Yes, on-site intersections would be designed to address these concerns</p>
New sidewalks, curb ramps, curbs and gutters meet current City and ADA standards	<ul style="list-style-type: none"> • Always required 	<p>Yes, all on-site sidewalks, curb ramps, curbs and gutters would meet current City and ADA standards</p>



TABLE 16
APPLICATION OF CITY OF OAKLAND TDM PROGRAM COMPONENTS

TDM Strategy	Required When	Applied to the Proposed Project?
No monthly permits and establish minimum price floor for public parking	<ul style="list-style-type: none"> If proposed parking ratio exceeds 1:1000 sf (commercial) 	Yes , no monthly permits offered, a price floor would be established for all commercial developments, regardless of parking ratio
Parking garage is designed with retrofit capability	<ul style="list-style-type: none"> Optional if proposed parking ratio exceeds 1:1.25 (residential) or 1:1000 sf (commercial) 	Yes , commercial developments exceeding a 1:1000 sf parking ratio would be designed with retrofittable garages
Parking space reserved for car share	<ul style="list-style-type: none"> A project is located within downtown (CBD and D-LM zones). One car share space preserved for buildings between 50 – 200 units, then one car share space per 200 units. 	Yes , project would car share parking
Paving, lane striping or restriping (vehicle and bicycle), and signs to midpoint of street section	<ul style="list-style-type: none"> Typically required 	Yes , project would construct all new streets
Pedestrian crossing improvements and supportive signal changes such as reducing cycle lengths to less than 90 seconds, leading pedestrian interval, "scramble" signal phase where appropriate.	<ul style="list-style-type: none"> Identified as an improvement within site analysis Identified as an improvement within operations analysis 	Yes , pedestrian crossing improvements would be provided on-site where appropriate
Real-time transit information system	<ul style="list-style-type: none"> A project frontage block includes a bus stop or BART station and is along a Tier 1 transit route with 2 or more routes or peak period frequency of 15 minutes or better 	Yes , project is located less than a 5-minute walk to bus transit and about 20 minutes from BART
Relocating bus stops to far side	<ul style="list-style-type: none"> A project is located within 0.10 mile of any active bus stop that is currently near side 	Yes , all new bus stops adjacent to the project and on the project site would be provided after passing through a traffic signal.
Signal upgrades, including typical traffic lights, pedestrian signals, bike actuated signals, transit only signals	<ul style="list-style-type: none"> Project size exceeds 100 residential units, 80,000 sf of retail, or 100,000 sf of commercial; and Project frontage abuts an intersection with signal infrastructure older than 15 years 	Yes , all traffic signals would meet city standards in effect at the time of upgrade or installation
Transit queue jumps	<ul style="list-style-type: none"> Identified as a needed improvement within operations analysis of a project with frontage along a Tier 1 transit route with 2 or more routes or peak period frequency of 15 minutes or better 	Yes , transit queue jumps are being considered as part of bus only lanes.



TABLE 16
APPLICATION OF CITY OF OAKLAND TDM PROGRAM COMPONENTS

TDM Strategy	Required When	Applied to the Proposed Project?
Trenching and placement of conduit for providing traffic signal interconnect	<ul style="list-style-type: none"> • Project size exceeds 100 units, 80,000 sf of retail, or 100,000 sf of commercial; and • Project frontage block is identified for signal interconnect improvements as part of a planned ITS improvement; and • A major transit improvement is identified within operations analysis requiring traffic signal interconnect 	Yes , project would ensure that new traffic signal installations are interconnected to city standards at the time of installation as well as upgraded intersections
Unbundled parking	<ul style="list-style-type: none"> • New multifamily dwelling residential facilities of ten (10) or more units, except for affordable housing 	Yes , project would provide unbundled parking for all residential and office developments

Sources: City of Oakland Transportation Impact Review Guidelines, 2017 and City of Oakland Municipal Code, 2018

3.2.3 ON-GOING OPERATIONAL STRATEGIES

Project 2.0 would also implement on-going operational strategies to support the use of non-auto transportation modes. The potential operational strategies to be considered as development occurs are summarized below:

- *Unbundled Parking* – Unbundle parking costs from housing costs. This would result in residents paying one price for the residential unit and a separate price for parking, should they opt for a space. The price of a parking space would be adjusted so that resident parking demand matches the building's parking supply. Similarly, offices would not be allowed to include parking as part of the rent and would instead rent out office space and parking spaces separately.
- *Pre-tax Commuter Benefits* – Encourage project tenants to enroll in WageWorks or other service to help with pre-tax commuter savings. This strategy allows employees to deduct monthly transit passes or other amount using pre-tax dollars. This can help to lower payroll taxes and allows employees to save on transit.
- *Carshare Parking Spaces* – For residential developments, dedicate for free at least the minimum number of on-site parking spaces the City of Oakland Municipal Code Section 17.116.105 requires be made available for carsharing in downtown zones. For office developments, dedicate at least one on-site parking space for carsharing. For hotel developments, dedicate for free at least one on-site parking space for carsharing, if on-site parking is provided.



- *Guaranteed Ride Home* – Encourage project commercial tenants to register their employees and promote the Alameda County Transportation Commission Guaranteed Ride Home (GRH) program. GRH programs encourage the use of alternative modes of transportation by offering free rides home if an illness or crisis occurs, if the employee is required to work unscheduled overtime, if a carpool or vanpool is unexpectedly unavailable, or if a bicycle problem arises. The Alameda County Transportation Commission offers their GRH service for all registered permanent employees who are employed within Alameda County, live within 100 miles of their worksite, and do not drive alone to work. The GRH program is offered at no cost to the employer, and employers are not required to register for their employees to enroll and use the program. The GRH program can also apply to future employed residents of the project.
- *Bicycle Parking Supply and Monitoring* – Meet or exceed the City of Oakland's minimum requirements for bicycle parking established in Section 17.117. Building management would monitor the usage of these facilities and provide additional bicycle parking, if necessary.
- *TDM Coordinator* – Building management would designate a TDM coordinator for the building who will provide tenants and employees information about transportation options in the project area and the TDM strategies provided by the building. In addition, each commercial tenant would designate a staff person as their TDM coordinator to coordinate, monitor and publicize TDM activities. Information about transportation options and TDM strategies would be posted at central locations and provided to building tenants, to be updated as necessary. Marketing strategies can promote alternative trips by making commuters aware of the options and incentives of using non-automobile transportation. Implementing commute trip reduction strategies with a complementary marketing strategy can increase the overall effectiveness of the program. This information would include:
 - *Commuter Benefits Program* – Provide information on the Bay Area Commuter Benefits Program (Air District Regulation 14, Rule 1). Employers with 50 or more full-time employees within the Bay Area Air Quality Management District (Air District) geographic boundaries are required to register and offer one of four commuter benefits to their employees: a pre-tax benefit, an employer-provided subsidy, employer-provided transit, or an alternative commute benefit. (Information about Commute Benefits Program is at 511.org/employers/commuter/overview.)
 - *Transit Routes* – Promote the use of transit by providing user-focused maps. These maps provide residents with wayfinding to nearby transit stops and transit-accessible destinations and are particularly useful for those without access to portable mapping applications. Project developments would consider installing real-time transit information, such as TransitScreen, in visible locations to provide residents and employees with up-to-date transit arrival and departure times.



- *Transit Fare Discounts* – Provide information about local discounted fare options offered by BART and AC Transit, including discounts for youth, elderly, persons with disabilities, and Medicare cardholders.
- *Car Sharing* – Promote accessible car sharing programs, such as Zipcar and Getaround, by informing residents and employees of on-site and nearby car sharing locations and applicable membership information.
- *Ridesharing* – Provide residents and employees with phone numbers and contact information for ride sharing options including Uber, Lyft, and Oakland taxicab services.
- *Carpooling* – Provide residents and employees with phone numbers and contact information for carpool matching services such as the Metropolitan Transportation Commission's 511 RideMatching.
- *Walking and Biking Events* – Provide information about local biking and walking events, such as Oaklavia, as events are planned.
- *Bikeshare* – Educate residents and employees about nearby bike sharing station locations and membership information.

3.3 NON-BALLPARK DEVELOPMENT PROJECT 2.0 VTR

The calculation of Project 2.0 VTR estimates for the non-ballpark development at Howard Terminal is mostly driven by parking reductions, as the impacts of the physical improvements and on-going operational strategies are not as easy to accurately model. For the purposes of this memorandum, all the physical improvements and operational strategies were estimated to have a combined VTR of two percent of trips not already reduced by parking reductions. Research from the California Air Pollution Control Officers Association (CAPCOA) in *Quantifying Greenhouse Gas Mitigation Measures (August 2010)* found that the TDM components with documented effectiveness included in Project 2.0 collectively surpass that two-percent level of impact.¹

¹ The CAPCOA document estimates that providing a high-connectivity pedestrian access network with pedestrian-oriented design both within the project site and connecting off-site in an urban/suburban area that encourages people to walk instead of drive reduces VMT by 2%. Other TDM measures included in the project and described in the CAPCOA document include implementing a car-sharing program (0.7% reduction), providing secure bicycle parking (0.6% reduction), and commute trip reduction programs like ride-matching assistance (up to 6.2% commute reduction). Transit and bicycle infrastructure improvements are also included in the CAPCOA document, but the provided method to calculate the estimated benefit does not straightforwardly apply to the project.



To calculate the VTR impact of parking reductions for residential uses, vehicle trips were estimated to be equal proportion to vehicle ownership. This is supported by the 2017 National Household Travel Survey, which found that households with one vehicle had less than half the annual VMT of households with two vehicles, although this did not control for location.

The number of trips for the office component was estimated to be proportional to the number of spaces provided. Most office trips occur as part of the daily commute, and a reduction in the number of spaces reduces the number of potential driving commuters.

For the retail/restaurant component, the number of spaces provided in Project 2.0 was compared to the parking demand for each hour of each day type for non-December and December months derived from ITE's *Parking Generation (4th Edition)*. When parking demand was in excess of parking supply, vehicles in excess of supply would be forced to shift modes or otherwise eliminate their vehicle trip due to the inability to park. The total number of vehicles to successfully park over the course of one year was compared to the total annual parking demand to estimate VTR.

Some of the trips that would have otherwise been made by private vehicle if ample parking were provided would instead use a TNC in Project 2.0, which would negate and (due to the doubled trip count) reverse any VTR benefit from that switched trip. Commute data from nearby census tracts was used to estimate the number of trips that would switch to TNCs. According to the US Census, approximately 3% of nearby office workers who did not drive alone to work used a taxi, as did about 7% of nearby residents.¹ This data was used to estimate the TNC switch rate for the office and residential land uses, and the residential rate was used for the retail and restaurant land uses. However, as described in Section 3.2.2 and Section 3.2.3, non-automobile travel modes such as BART, AC Transit, ferries, walking, and bicycling are prioritized in Project 2.0 so that fewer of these trips switch to TNCs, though any effect on TNC use from these non-automobile measures is not modeled.

Table 17 presents the trip generation and VTR estimates for each component of the Howard Terminal non-ballpark development for a typical weekday and weekend. Although the weekend VTR shown in Table 17 is less than a 20 percent reduction, the table corresponds to a yearly VTR of over 20 percent, as the VTR from weekdays in excess of 20 percent brings the total VTR for the project to 20 percent over a one-year period.

¹ U.S. Census Bureau, 2006-2010 Census Transportation Planning Products 5-Year Data Set, Alameda County Census Tracts 4030, 4031, and 9832, Table B206200C and U.S. Census Bureau, 2013-2017 American Community Survey 5-Year Estimates, Alameda County Census Tract 9832, Table B08006.



TABLE 17
VTR ESTIMATES FOR HOWARD TERMINAL NON-BALLPARK DEVELOPMENT

Land Use	Weekday			Weekend		
	Project 1.0	Project 2.0	VTR	Project 1.0	Project 2.0	VTR
Residential	7,600	5,700	-25%	7,000	5,300	-28%
Office	9,700	7,100	-26%	1,400	1,100	-24%
Retail	5,700	4,800	-15%	5,900	4,900	-16%
Restaurant	6,400	5,400	-15%	7,400	6,200	-16%
Hotel ¹	2,600	1,300	-50%	2,000	1,000	-50%
Performance Venue	2,900	2,900	-0%	2,900	2,900	-0%
Total With Venue	34,900	27,200	-22%	26,600	21,400	-20%
Total Without Venue	32,000	24,300	-24%	23,700	18,500	-22%

1. Project 2.0 trips presented for the hotel apply to gamedays only. On non-gamedays, Project 2.0 hotel trips would be 2,600 trips and 2,000 trips for weekdays and weekends, respectively.

Source: Fehr & Peers, 2019.

Table 17 presents VTR from the non-ballpark development on days with and without the performance venue, which would be in operation about 100 days per year. Days when a baseball game and an event at the performance venue overlap, an additional 3% VTR could be achieved, but these reductions were conservatively excluded from the annual VTR calculations because a detailed event scheduling plan is not available. Days with an event at the performance venue may also create some additional VTR through use of the hotel by performers and attendees, though that effect is also not modeled and is estimated to be small because many performers use tour buses instead of hotels, and most attendees would be expected to be local guests.

Table 17 shows Project 2.0 trips for the hotel use on gamedays, when about one half of the hotel would cater to the visiting baseball team and related activities. On non-gamedays, overall VTR for the development would be about 4% less. Over the course of one year with 81 baseball games and 100 events at the performance venue, the weighted average VTR for the non-ballpark development is 20%.



3.3.1 IMPACT OF GONDOLA ON NON-BALLPARK DEVELOPMENT

A gondola between Howard Terminal and Downtown Oakland may be provided as a part of the final suite of TDM measures for the ballpark component of the project. Unlike other ballpark TMP/TDM measures, which would primarily affect travel related to ballpark events, a gondola would be available for the daily use of residents and workers of the non-ballpark development and others in the Jack London District. By improving non-automobile access between Howard Terminal and the offices, residents, retail, entertainment, and transit stops of Downtown Oakland, the construction of a gondola would reduce daily vehicle trips to and from the non-ballpark development.

The VTR impact of the gondola on non-ballpark development can be estimated using the Oakland TIRG. The TIRG estimates that developments within 0.5 miles of a BART station have an additional 10 percent reduction from ITE trip generation rates compared to developments between 0.5 miles and 1.0 miles of a BART station. This implies that reducing the distance to a BART station by about a 10-minute walk would reduce automobile trip generation by about 10 percent. Travel time savings to the 12th Street Oakland City Center BART station provided by the gondola is expected to be 8- to 10 minutes. Trip reductions of an additional 10 percent from the ITE rates correspond to an additional nine to 11 percent VTR for Project 2.0 compared to Project 1.0.

4 MONITORING, EVALUATION, AND ENFORCEMENT

The A's and the non-ballpark development community would monitor and refine the TMP and the TDM Plan for the ballpark and the non-ballpark development, respectively, in conjunction with the City of Oakland through field monitoring during the project's first two years of operations and an annual surveying and reporting program thereafter. The TMP and the TDM Plan will be continually refined by improving existing measures and introducing new strategies. All proposed and approved changes to either the TMP or the TDM Plan will be reported and referenced in the Annual Report.

4.1 MONITORING METHODS

The following methods will be employed to monitor the TMP and the TDM Plan strategies.

1. Quarterly Coordination Meetings – the on-site Transportation Coordinator and key Ballpark staff will meet quarterly with the City's designated representative, other key City staff, and other transportation service providers to evaluate the TMP and TDM Plan strategies. These meetings will occur during the first two years of the project, and then annually thereafter.



2. Inaugural Event Monitoring – a designated team of Ballpark and City staff will monitor pre-event and post-event transportation conditions at several of the first A's games and events held at the Ballpark, and collaboratively adjust improve transportation efficiencies.
3. Subsequent Event Monitoring - a designated team of Ballpark and City staff will monitor pre-event and post-event transportation conditions intermittently during the first four years of operation at the Ballpark.
4. Curb Pick-Up and Drop-Off Operations – the on-site Transportation Coordinator will regularly monitor curb operations during the first year of operation.
5. Event Attendee Surveys – annual travel surveys of at least 1,000 attendees will be conducted at five weekday evening games and at one weekday day game and one weekend game at the Ballpark. The surveys will identify such data as pre-event origin and post-event destination, arrival and departure times, arrival and departure modes, transit provider, parking location, number of vehicle occupants (auto mode), etc. The survey will be developed in coordination with the City of Oakland.
6. Ballpark Employee Surveys – annual travel surveys given to attendees will also be given to permanent and temporary employees to identify the same travel information for A's employees as well as to determine their awareness of alternative modes and travel demand management programs that are available to them. The A's will commit to a minimum of 60 percent survey completion rate. The survey will be developed in coordination with the City of Oakland.
7. Non-ballpark Development Employee and Resident Surveys – annual travel surveys given to employees and residents of the non-ballpark development will also be given to identify the same travel information for A's employees, as well as to determine their awareness of alternative modes and travel demand management programs that are available to them. The survey will be developed in coordination with the City of Oakland.
8. Parking Strategies – data will be collected on parking utilization rates, and effectiveness of on-site and off-site parking strategies, for all events.

4.2 MONITORING DOCUMENTATION

The results of the monitoring process will be documented as follows.

1. TMP Travel Survey Memorandum – a memorandum will be prepared within three months of the inaugural events (MLB game, special event) that documents the results of the initial travel surveys as well as ongoing event monitoring.
2. Annual Monitoring Report – a report will be developed and submitted to the City of Oakland annually, beginning one year following commencement of project construction and continuing for the life of the project. The Annual Monitoring Report shall summarize the current implementation and compliance status at the time of the report for all



mitigation and improvement measures, and all TMP measures, for which the A's and non-ballpark development community have been assigned some or all reporting responsibility. For measures that another entity (e.g., a transit service provider) is responsible for implementing, the A's and the non-ballpark development community shall only report on readily available information about the implementation and compliance status. This Annual Monitoring Report may include the TMP and the TDM Plan monitoring surveys and reports that address how effectively the TMP and the TDM Plan is meeting the monitoring objective of reducing vehicle trips by 20 percent. It would also propose changes, adjustments, and improvements to the TMP and the TDM Plan, as needed.

4.3 PERFORMANCE STANDARDS

The TMP and the TDM Plan include various performance measures once the project is in operation and initial monitoring results are available, and the results will be measured against these criteria. If not achieved, the A's and the non-ballpark development community will be required to work with the appropriate agency or stakeholder group to ensure that the standards are met. The following performance standards have been developed specifically for AB 734 compliance:

1. Vehicle Trip Reduction (VTR) of 20 percent for the ballpark events.
2. Vehicle Trip Reduction (VTR) of 20 percent for the non-ballpark development.

If ongoing monitoring shows that one or both performance standards are not being met, the A's and/or the non-ballpark development community will explore additional strategies, operational efforts, or minor redesigns to meet the 20 percent VTR goals. Revisions to policy will be brought before the City of Oakland.

5 ADDITIONAL TRANSPORTATION ANALYSES

In addition to a 20-percent reduction in vehicle trips, AB 734 also requires goals for emissions of greenhouse gases (GHGs) to qualify under AB 734. A vehicle-miles traveled (VMT) assessment and a study of traffic operations and delay in the Port of Oakland were performed to support subsequent GHG analysis.



5.1 VEHICLE-MILES TRAVELED ASSESSMENT

An estimate of the VMT associated with the ballpark and non-ballpark components for Project 1.0 and Project 2.0 is presented below. Because the ballpark replaces existing uses at the Coliseum, a VMT estimate of the current use is also provided.

The vehicle trip reduction criteria for AB 734 is measured at two discrete time periods for the ballpark and non-ballpark components of the project—within one year of completion of the first baseball season for the ballpark component, and within one year of completion of the non-ballpark development for that component. However, the first baseball season played at the Howard Terminal ballpark will occur well before the non-ballpark development is completed, and further development of the non-ballpark component will affect operations at the ballpark due to a reduction of ballpark parking from 3,500 to 2,000 on-site spaces.

Because the GHG analysis assesses emissions over the entire schedule of development, trip generation and VMT estimates were prepared for both the ballpark and non-ballpark development both at Phase 1 (i.e. the end of the first baseball season) and at full buildout of the non-ballpark development.

5.1.1 BALLPARK VMT

The ballpark at Howard Terminal would host Oakland A's baseball games, as well as large concerts and smaller other events, including corporate/community events and plaza events. The baseball games would replace games currently held at the Coliseum, and the ballpark would be expected to compete for large concerts with Oracle Arena. These uses were therefore studied in the existing VMT estimates to compare against estimated VMT for future uses at the Howard Terminal ballpark.

5.1.1.1 Existing VMT at the Coliseum and Oracle Arena

Location-based services cell phone data from the 2016 and 2017 seasons was used to estimate the distribution of automobile origins and destinations for current ballgame attendees for each game type. This data was aggregated by census block group, and a roadway network analysis was performed to calculate the shortest travel distance between the centroid of each block group and the Coliseum. The distribution and travel distances were then used to estimate the average vehicle



trip length for each game type. A similar process was performed to estimate average trip lengths for NFL games and Monster Jam events at the Coliseum, as well as large concerts at Oracle Arena.¹

VMT was calculated for each of these events using their estimated mode shares, average attendance, and average trip lengths. As elsewhere in this memorandum, TNC trips were represented as two trips: one 1-mile long trip for the TNC to travel to pick up the attendee, and one trip at the average trip lengths transporting the attendee to or from the event. The methodology for estimating travel mode splits for the baseball games is described in Section 2.2.1, and a similar method was applied to the concerts, NFL games, and Monster Jam events.

Table 18 presents the existing travel characteristics and VMT of attendees of baseball games, NFL games, and Monster Jam and Moto-Cross events at the Coliseum, as well as large concerts at Oracle Arena, given observed attendance levels.

To provide an equivalent basis of comparison for the Howard Terminal ballpark analysis, an estimated VMT for 35,000-attendee ballgames and 28,000-attendee concerts was calculated, given the same travel mode and trip length characteristics as calculated for the existing conditions. The estimated VMT under these conditions are presented in **Table 19**.

5.1.1.2 Ballpark Project 1.0 VMT Estimates

To calculate Project 1.0 average trip distances, the roadway network distances for the vehicle origin-destination location-based services data were calculated with respect to distance to Howard Terminal. The distribution was also modified to account for the changed geographic composition of attendees and a shifted travel mode for attendees near Howard Terminal. The methodology used to estimate travel mode and geographic composition for Project 1.0 is described in Section 2 of this memorandum. **Table 20** presents the estimated VMT at Howard Terminal for baseball games, large concerts, and other events expected to utilize the ballpark under Project 1.0 conditions before the implementation of a TMP.

¹ The following concerts at Oracle Arena in 2017 were used for this analysis: Red Hot Chili Peppers (3/12), Panic! At the Disco (3/25), Roger Waters (6/10), Arcade Fire (10/21), Enrique Iglesias and Pitbull (10/28), and Jay-Z (12/16).



TABLE 18
EXISTING VMT – OBSERVED ATTENDANCE LEVELS

Event Type	Travel Mode			Average Attendees (2017)	Total Vehicle Trips ^{1,2}	Average Trip Length (mi) ³	Vehicle-Miles Traveled ^{1,2}
	Drive	TNC	Other Modes				
Baseball Games							
<i>Weekday Evening</i>	70%	7%	23%	11,868	8,400	13.3	104,000
<i>Weekday Day</i>	71%	7%	22%	8,879	6,500	13.8	83,000
<i>Weekend</i>	74%	7%	19%	17,086	12,800	14.2	168,000
Large Concerts ⁴	73%	7%	20%	12,597	9,500	12.1	107,000
NFL Games	69%	7%	24%	54,664	26,600	16.4	393,000
Monster Jam	77%	8%	15%	47,500	26,300	18.5	439,000
Moto-Cross ⁵	77%	8%	15%	47,500	26,300	18.5	439,000

Notes:

1. TNC trips are represented as two trips: one 1-mile-long trip for the TNC to travel to pick up the attendee, and one at the average trip length transporting the attendee to or from the event.
2. Includes event staff of 760 for ballgames, 1,200 for large concerts, 1,620 for NFL games, and 1,000 for Monster Jam and Motocross events, with a mode share of 15% driving in single-occupancy vehicles.
3. Does not include TNC trips to pick up attendees.
4. Represented by high-demand concerts at Oracle Arena in 2017: Red Hot Chili Peppers (3/12), Panic! At the Disco (3/25), Roger Waters (6/10), Arcade Fire (10/21), Enrique Iglesias and Pitbull (10/28), and Jay-Z (12/16).
5. Moto-cross travel characteristics were not available, so data for Monster Jam was used instead.

Source: Fehr & Peers, 2019.

TABLE 19
EXISTING VMT – HOWARD TERMINAL CAPACITY ATTENDANCE

Event Type	Travel Mode			Attendees ¹	Total Vehicle Trips ^{2, 3}	Average Trip Length (mi) ⁴	Vehicle-Miles Traveled ^{2, 3}
	Drive	TNC	Other Modes				
Baseball Games							
<i>Weekday Evening</i>	70%	7%	23%	35,000	24,400	13.3	304,000
<i>Weekday Day</i>	71%	7%	22%	35,000	24,500	13.8	315,000
<i>Weekend</i>	74%	7%	19%	35,000	24,700	14.2	325,000
Large Concerts ⁵	73%	7%	20%	28,000	20,700	12.1	232,000

Note:

1. Ballpark attendance equivalent to maximum attendance at Howard Terminal.
2. TNC trips are represented as two trips: one 1-mile-long trip for the TNC to travel to pick up the attendee, and one at the average trip length transporting the attendee to or from the event.
3. Baseball has 1,500 event staff, concerts have 1,200 event staff, NFL has 1,500 event staff, and Monster Jam and Motocross each have 1,000 event staff.
4. Does not include TNC trips to pick up attendees.
5. Represented by high-demand concerts at Oracle Arena in 2017: Red Hot Chili Peppers (3/12), Panic! At the Disco (3/25), Roger Waters (6/10), Arcade Fire (10/21), Enrique Iglesias and Pitbull (10/28), and Jay-Z (12/16).

Source: Fehr & Peers, 2019



TABLE 20
HOWARD TERMINAL BALLPARK VMT – PROJECT 1.0

Event Type	Travel Mode			Maximum Event Characteristics per Event			
				Attendees	Total Vehicle Trips ⁵	Average Trip Length (mi) ⁶	Vehicle-Miles Traveled
	Drive	TNC	Other				
Baseball Games ¹							
<i>Weekday Evening</i>	57%	18%	25%	35,000	27,300	13.3	299,000
<i>Weekday Day</i>	56%	19%	25%	35,000	27,800	13.3	300,000
<i>Weekend</i>	62%	18%	20%	35,000	28,600	14.1	336,000
Large Concerts ²	57%	20%	23%	28,000	22,800	11.4	213,000
Other Events ^{3, 4}	57%	20%	23%	7,500	6,100	11.4	57,000
Corporate/ Community Events ^{3, 4}	57%	20%	23%	2,000	1,600	11.4	15,000
Plaza Events ^{3, 4}	57%	20%	23%	4,000	3,200	11.4	30,000

Note:

1. There are 81 regular season baseball games each with 1,320 event staff.
2. There are 3 to 15 concerts per year with annual average of 9 concerts each with 1,200 staff.
3. There are 35 other events per year (480 staff), 100 corporate / community events per year (25 staff), and 16 plaza events (25 staff) per year.
4. Large concert travel characteristics used for the smaller events proposed for the ballpark.
5. TNC trips are represented as two trips: one 1-mile-long trip for the TNC to travel to pick up the attendee, and one at the average trip length transporting the attendee to or from the event.
6. Does not include TNC trips to pick up attendees.

Source: Fehr & Peers, 2019

5.1.1.3 Ballpark Project 2.0 VMT Estimates

As described in Section 2, Project 2.0 would reduce vehicle trips at the ballpark by at least 20 percent compared to Project 1.0. The TDM measures that are part of Project 2.0 affect not only travel mode choice, but also average vehicle trip lengths, as the measures do not affect mode choice decisions proportionally at all travel distances. For example, because TNC trips to the ballpark are on average shorter than trips by private vehicle, TDM measures that discourage TNC use in favor of non-automobile modes will increase average vehicle trip lengths.

Table 21 presents the estimated VMT at Howard Terminal for baseball games, large concerts, and other events expected to utilize the ballpark under Project 2.0 conditions in Phase 1 after the implementation of a TMP.

At full buildout of the non-ballpark development, on-site parking at the ballpark will be reduced to 2,000 spaces. **Table 22** presents the estimated VMT at Howard Terminal for baseball games, large concerts, and other events expected to utilize the ballpark under Project 2.0 conditions at full buildout after the implementation of a TMP.



TABLE 21
HOWARD TERMINAL BALLPARK VMT – PROJECT 2.0 (PHASE 1)

Event Type	Travel Mode			Maximum Event Characteristics per Event			
				Attendees	Total Vehicle Trips ⁵	Average Trip Length (mi) ⁶	Vehicle-Miles Traveled
	Drive	TNC	Other				
Baseball Games ¹							
<i>Weekday Evening</i>	48%	13%	39%	35,000	21,900	13.7	251,000
<i>Weekday Day</i>	34%	17%	49%	35,000	20,100	13.7	213,000
<i>Weekend</i>	48%	14%	38%	35,000	22,600	14.5	272,000
Large Concerts ²	59%	11%	30%	28,000	19,300	11.8	200,000
Other Events ^{3, 4}	63%	10%	27%	7,500	5,300	11.8	56,000
Corporate/ Community Events ^{3, 4}	63%	10%	27%	2,000	1,400	11.8	15,000
Plaza Events ^{3, 4}	63%	10%	27%	4,000	2,800	11.8	29,000

Note:

1. There are 81 regular season baseball games each with 1,320 event staff.
2. There are 3 to 15 concerts per year with annual average of 9 concerts each with 1,200 staff.
3. There are 35 other events per year (480 staff), 100 corporate / community events per year (25 staff), and 16 plaza events (25 staff) per year.
4. Large concert travel characteristics used for the smaller events proposed for the ballpark.
5. TNC trips are represented as two trips: one 1-mile-long trip for the TNC to travel to pick up the attendee, and one at the average trip length transporting the attendee to or from the event.
6. Does not include TNC trips to pick up attendees.

Source: Fehr & Peers, 2019



TABLE 22
HOWARD TERMINAL BALLPARK VMT – PROJECT 2.0 (FULL BUILDOUT)

Event Type	Travel Mode			Maximum Event Characteristics per Event			
				Attendees	Total Vehicle Trips ⁵	Average Trip Length (mi) ⁶	Vehicle-Miles Traveled
	Drive	TNC	Other				
Baseball Games ¹							
<i>Weekday Evening</i>	37%	16%	47%	35,000	20,200	13.7	220,000
<i>Weekday Day</i>	24%	19%	57%	35,000	18,400	13.7	182,000
<i>Weekend</i>	37%	17%	46%	35,000	21,000	14.5	239,000
Large Concerts ²	46%	14%	40%	28,000	17,700	11.8	173,000
Other Events ^{3, 4}	63%	10%	27%	7,500	5,300	11.8	56,000
Corporate/ Community Events ^{3, 4}	63%	10%	27%	2,000	1,400	11.8	15,000
Plaza Events ^{3, 4}	63%	10%	27%	4,000	2,800	11.8	29,000

Note:

1. There are 81 regular season baseball games each with 1,320 event staff.
2. There are 3 to 15 concerts per year with annual average of 9 concerts each with 1,200 staff.
3. There are 35 other events per year (480 staff), 100 corporate / community events per year (25 staff), and 16 plaza events (25 staff) per year.
4. Large concert travel characteristics used for the smaller events proposed for the ballpark.
5. TNC trips are represented as two trips: one 1-mile-long trip for the TNC to pick up the attendee, and one at the average trip length transporting the attendee to or from the event.
6. Does not include TNC trips to pick up attendees.

Source: Fehr & Peers, 2019

5.1.2 NON-BALLPARK VMT

For the non-ballpark component of the project, average trip lengths were estimated using outputs from the Alameda CTC travel model. The model was run using a modified land use file, with the project's TAZ changed to add the land use described in Section 3 of this memorandum. The resulting average trip length for the project trips was 12.0 miles.

In Phase 1, the non-ballpark development would have 540 multifamily residential units, 314,000 square feet of office space, 20,000 square feet of retail space, 10,000 square feet of restaurant space, and a 400-room hotel. Trip generation estimates for Phase 1 follow the same process outlined in Section 3 for full buildout, and Project 2.0 includes the same TDM measures as full buildout.

Estimated daily weekday and weekend VMT in Phase 1 under Project 1.0 and Project 2.0 is presented in **Table 23**, based on the trip generation estimates and the average trip length derived from the Alameda CTC travel model. The Project 2.0 trips and VMT for the hotel use represent operations on gamedays. For non-gamedays, hotel trips and VMT would be the same as in Project 1.0.



TABLE 23
DAILY TRIPS AND VMT FOR HOWARD TERMINAL NON-BALLPARK DEVELOPMENT (PHASE 1)

Land Use	Weekday				Weekend			
	Project 1.0		Project 2.0		Project 1.0		Project 2.0	
	Trips	VTM	Trips	VTM	Trips	VTM	Trips	VTM
Residential	1,500	17,800	1,100	13,200	1,400	16,300	1,000	12,300
Office	2,000	24,500	1,500	18,000	300	3,500	200	2,600
Retail	1,300	15,400	1,100	13,100	1,500	18,200	1,300	15,500
Restaurant	700	8,600	600	7,500	800	10,000	700	8,400
Hotel ¹	2,600	31,100	1,300	15,600	2,000	24,500	1,000	12,300
Performance Venue	-	-	-	-	-	-	-	-
Total With Venue	-	-	-	-	-	-	-	-
Total Without Venue	8,100	97,400	5,600	67,400	6,000	72,500	4,200	51,100

1. Project 2.0 trips and VMT for the hotel use represent operations on gamedays. For non-gamedays, hotel trips and VMT would be the same as in Project 1.0.

Source: Fehr & Peers, 2019.

Estimated daily weekday and weekend VMT at full buildout under Project 1.0 and Project 2.0 is presented in **Table 24**, based on the trip generation estimates and the average trip length derived from the Alameda CTC travel model. As in Table 23, trips and VMT for the hotel use represent operations on gamedays. For non-gamedays, hotel trips and VMT would be the same as in Project 1.0. Trip generation and average trip length estimates for the performance venue are derived from the methodology used for special events at the Howard Terminal ballpark.



TABLE 24
DAILY TRIPS AND VMT FOR HOWARD TERMINAL NON-BALLPARK DEVELOPMENT
(FULL BUILDOUT)

Land Use	Weekday				Weekend			
	Project 1.0		Project 2.0		Project 1.0		Project 2.0	
	Trips	VMT	Trips	VMT	Trips	VMT	Trips	VMT
Residential	7,600	91,200	5,700	68,300	7,000	84,000	5,300	63,100
Office	9,700	116,400	7,100	85,600	1,400	16,800	1,100	12,700
Retail	5,700	68,400	4,800	57,200	5,900	70,800	4,900	59,400
Restaurant	6,400	76,800	5,400	64,400	7,400	88,800	6,200	74,600
Hotel	2,600	31,100	1,300	15,600	2,000	24,500	1,000	12,300
Performance Venue	2,900	33,700	2,900	33,700	2,900	33,700	2,900	33,700
Total With Venue	34,900	417,600	27,200	324,800	26,600	318,600	21,400	255,800
Total Without Venue	32,000	383,900	24,300	291,100	23,700	284,900	18,500	222,100

Source: Fehr & Peers, 2019.

5.1.3 VMT CHANGE FROM ADDITIONAL TDM MEASURES

By reducing vehicle trips, the implementation of additional TDM measures not modeled as part of Project 2.0 for this analysis would also reduce VMT. The change in VMT was studied for:

- Gondola service between the 12th Street City Center BART station and Howard Terminal
- The extension of AC Transit lines to provide high-frequency bus service to Howard Terminal
- Gameday shuttles between the three nearby BART stations and the ballpark

Table 25 presents VMT change from implementation of each of these TDM measures. All three TDM measures reduce trips and VMT on gamedays. The gondola also provides improved transit access to Howard Terminal residents, employees, and visitors on non-gamedays, and a VTR and VMT reduction estimate was modeled according to the TIRG guidelines. While AC Transit extensions would also improve transit access and encourage the use of non-automobile travel modes on non-gamedays, no VTR or VMT benefit was modeled to present a conservative analysis.



TABLE 25
CHANGE IN VMT FROM ADDITIONAL TMP MEASURES

Event Type	Baseball and Large Events Only					
	Gondola ¹		Extend Buses		Shuttles	
	VTR ³	VMT ⁴	VTR ³	VMT ⁴	VTR ³	VMT ⁴
Baseball Games						
Weekday Evening	6%	-11,200	1%	-1,900	3%	-6,200
Weekday Day	8%	-16,000	1%	-2,100	4%	-8,500
Weekend	5%	-12,000	1%	-1,500	3%	-6,500
Large Concerts ²	4%	-5,900	1%	-900	2%	-3,200
Ancillary Development – Phase 1						
Weekday	13%	-10,800				
Weekend	12%	-7,400				
Ancillary Development – Full Buildout						
Weekday	11%	-36,000				
Weekend	9%	-23,300				

Notes:

1. Gondola available year-round.
2. For other events, scale the estimates for large concerts.
3. Represents additional trip reduction when measure is added to modeled Project 2.0.
4. Represents change in total VMT when measure is added to modeled Project 2.0.

Source: Fehr & Peers, 2019

5.2 PORT OF OAKLAND TRAFFIC OPERATIONS

The increased traffic from development at Howard Terminal will introduce additional delay at nearby intersections, many of which have substantial truck volumes. Because idling trucks contribute to GHG emissions, the traffic operations of nearby intersections with heavy truck traffic were studied under existing conditions and on a typical weekday with the project. Intersection operations with ballpark traffic were not studied, as baseball games and concerts are special events and thus do not represent typical traffic at these intersections during the weekday afternoon and early evening. For example, truck traffic is greatest in the late afternoon (3 to 5 PM) when the ballpark would be active only 12 to 14 times during the year.

The following seven intersections were selected for study due to their proximity to Howard Terminal and heavy truck volumes:

- Adeline Street/3rd Street
- Adeline Street/5th Street
- Market Street/3rd Street



- Market Street/5th Street
- Martin Luther King Jr Way/3rd Street
- Martin Luther King Jr Way/5th Street
- Broadway/5th Street

5.2.1 EXISTING CONDITIONS

Data collection at the study intersections occurred from 3:00 PM to 8:00 PM during September 2018 on a typical weekday when schools were in session. This data collection consisted of multi-modal turning movement counts including vehicle type and intersection observations, including geometry, signal timing, and vehicle queuing. **Table 26** presents the observed existing truck volumes at the selected intersections.

Vehicle delay at the study intersections was assessed using Highway Capacity Manual methodologies. **Table 27** presents the existing average vehicle delay for all vehicles, including trucks and personal vehicles.

5.2.2 EXISTING PLUS NON-BALLPARK DEVELOPMENT

Hourly trip generation for the non-ballpark development under Project 2.0 was estimated using ITE hourly scaling factors. These trips were distributed and assigned to the roadway network based on results from the Alameda CTC Travel Model. **Table 28** presents the estimated vehicle delay for all vehicles, including trucks and personal vehicles, with the added traffic from the non-ballpark development.

TABLE 26
EXISTING TRUCK VOLUMES AT SELECTED INTERSECTIONS

Intersection	3-4 PM	4-5 PM	5-6 PM	6-7 PM	7-8 PM
Adeline Street / 3rd Street	361	472	241	171	201
Adeline Street / 5th Street	226	267	161	141	137
Market Street / 3rd Street	260	319	171	102	100
Market Street / 5th Street	93	133	97	56	41
Martin Luther King Jr. Way / 3rd Street	124	166	97	59	65
Martin Luther King Jr. Way / 5th Street	52	92	63	35	25
Broadway / 5th Street	112	140	117	79	57

Source: Fehr & Peers, 2019.



TABLE 27
VEHICLE DELAY – EXISTING CONDITIONS

Intersection	3-4 PM		4-5 PM		5-6 PM		6-7 PM		7-8 PM	
	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS
Adeline Street / 3rd Street	6	A	17	C	36	E	5	A	4	A
Adeline Street / 5th Street	18	B	20	B	23	C	16	B	14	B
Market Street / 3rd Street	4 (14)	A (B)	4 (16)	A (C)	3 (19)	A (C)	2 (10)	A (B)	3 (10)	A (B)
Market Street / 5th Street	11	B	11	B	12	B	10	B	9	A
Martin Luther King Jr. Way / 3rd Street	7	A	14	B	30	D	9	A	6	A
Martin Luther King Jr. Way / 5th Street	7	A	9	A	14	B	14	B	7	A
Broadway / 5th Street	37	D	44	D	67	E	54	D	38	D

Source: Fehr & Peers, 2019.

TABLE 28
VEHICLE DELAY – EXISTING PLUS NON-BALLPARK DEVELOPMENT

Intersection	3-4 PM		4-5 PM		5-6 PM		6-7 PM		7-8 PM	
	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS	Delay (sec.)	LOS
Adeline Street / 3rd Street	10	A	19	B	16	B	9	A	8	A
Adeline Street / 5th Street	27	C	36	D	36	D	24	C	20	C
Market Street / 3rd Street	15	B	20	B	22	C	15	B	14	B
Market Street / 5th Street	11	B	21	C	25	C	21	C	10	A
Martin Luther King Jr. Way / 3rd Street	9	A	12	B	15	B	11	B	10	A
Martin Luther King Jr. Way / 5th Street	11	B	17	B	21	C	18	B	10	A
Broadway / 5th Street	35	D	35	D	73	E	48	D	30	C

Source: Fehr & Peers, 2019.



APPENDIX A

PROJECT 1.0 AND PROJECT 2.0 MODE SELECTION

Project 1.0 - Baseball - Arrivals

Attachment A

Mode Shift of Current BART Attendees

Current BART Origins	Existing Coliseum BART Distribution			Drive	Mode Shift - Weekday Evening							Drive	Mode Shift - Weekday Day							Drive	Mode Shift - Weekend						
	Weekday Evening	Weekday Day	Weekend		TNC	Walk	Bike	Ferry	Bus	BART	TNC		Walk	Bike	Ferry	Bus	BART	TNC	Walk		Bike	Ferry	Bus	BART			
12TH	3%	3%	2%	0%	57%	40%	1%	0%	2%	0%	0%	57%	40%	1%	0%	2%	0%	0%	58%	41%	1%	0%	0%	0%			
19TH	3%	4%	2%	0%	73%	20%	2%	0%	5%	0%	0%	73%	20%	2%	0%	5%	0%	0%	72%	24%	2%	0%	2%	0%			
MCAR	2%	2%	2%	0%	60%	0%	0%	0%	0%	40%	0%	60%	0%	0%	0%	0%	40%	0%	60%	0%	0%	0%	0%	40%			
ASHB	1%	1%	1%	0%	40%	0%	0%	0%	0%	60%	0%	40%	0%	0%	0%	0%	60%	0%	40%	0%	0%	0%	0%	60%			
ROCK	2%	2%	2%	0%	40%	0%	0%	0%	0%	60%	0%	40%	0%	0%	0%	0%	60%	0%	40%	0%	0%	0%	0%	60%			
LAKE	3%	3%	3%	0%	51%	48%	1%	0%	0%	0%	0%	51%	48%	1%	0%	0%	0%	0%	51%	48%	1%	0%	0%	0%			
FTVL	3%	6%	4%	0%	50%	0%	0%	0%	0%	50%	0%	50%	0%	0%	0%	0%	50%	0%	50%	0%	0%	0%	0%	50%			
WOAK	1%	1%	1%	0%	73%	25%	2%	0%	0%	0%	0%	73%	25%	2%	0%	0%	0%	0%	73%	25%	2%	0%	0%	0%			
EMBR	6%	4%	4%	0%	0%	0%	0%	30%	0%	70%	0%	0%	0%	0%	5%	0%	95%	0%	0%	0%	0%	5%	0%	95%			
MONT	5%	3%	2%	0%	0%	0%	0%	20%	0%	80%	0%	0%	0%	0%	3%	0%	97%	0%	0%	0%	0%	3%	0%	97%			

Mode Shift of Current Vehicles

Current Vehicle Origins	Existing Coliseum Vehicle Distribution			Mode Shift - Weekday Evening							Mode Shift - Weekday Day							Mode Shift - Weekend							
	Weekday Evening	Weekday Day	Weekend	Drive	TNC	Walk	Bike	Ferry	Bus	BART	Drive	TNC	Walk	Bike	Ferry	Bus	BART	Drive	TNC	Walk	Bike	Ferry	Bus	BART	
<1 mile from HT	3%	2%	1%		10%	23%	63%	2%	0%	2%	0%	10%	23%	63%	2%	0%	2%	0%	10%	23%	63%	2%	0%	2%	0%
1-2 miles from HT	3%	3%	3%		20%	58%	15%	2%	0%	5%	0%	20%	58%	15%	2%	0%	5%	0%	20%	58%	15%	2%	0%	5%	0%
2-5 miles from HT	26%	24%	25%		58%	40%	0%	0%	0%	2%	0%	58%	40%	0%	0%	0%	2%	0%	58%	40%	0%	0%	0%	2%	0%
Richmond	5%	6%	4%		95%	5%	0%	0%	0%	0%	0%	95%	5%	0%	0%	0%	0%	0%	95%	5%	0%	0%	0%	0%	0%
Near Coliseum	9%	9%	7%		50%	20%	0%	0%	0%	2%	28%	50%	20%	0%	0%	0%	2%	28%	50%	20%	0%	0%	0%	2%	28%

Geographic Shift of Current Attendees

Shifts Away

Current BART Origins	Existing Coliseum BART Distribution			Percent of Distribution Lost		
	Weekday Evening	Weekday Day	Weekend	Weekday Evening	Weekday Day	Weekend
HAYW	2%	2%	3%	20%	20%	20%
SHAY	1%	2%	1%	30%	30%	30%
UCTY	3%	4%	3%	40%	40%	40%
FRMT	4%	4%	5%	50%	50%	50%
WSPR	3%	3%	2%	60%	60%	60%
CAST	3%	2%	4%	20%	20%	20%
WDUB	4%	5%	5%	30%	30%	30%
DUBL	10%	8%	12%	40%	40%	40%

Current Vehicle Origins	Existing Coliseum Vehicle Distribution			Percent of Distribution Lost		
	Weekday Evening	Weekday Day	Weekend	Weekday Evening	Weekday Day	Weekend
20-25 mi SE of HT	5%	5%	5%	20%	20%	10%
25-30 mi SE of HT	4%	5%	5%	30%	30%	15%
30-40 mi SE of HT	4%	4%	4%	40%	40%	20%
40+ mi SE of HT	3%	5%	5%	50%	50%	25%

Shifts Towards

New Attendees Origins	% of Attendees Gained				Mode Split - Weekday Evening								Mode Split - Weekday Day								Mode Split - Weekend							
	Weekday Evening	Weekday Day	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART		Drive	TNC	Walk	Bike	Ferry	Bus	BART		Drive	TNC	Walk	Bike	Ferry	Bus	BART	
Oakland/Piedmont		50%	50%	50%		30%	31%	13%	1%	0%	3%	22%		30%	31%	13%	1%	0%	3%	22%		30%	31%	13%	1%	0%	3%	22%
Central Contra Costa		20%	20%	20%		50%	10%	0%	0%	0%	0%	40%		50%	10%	0%	0%	0%	0%	40%		50%	10%	0%	0%	0%	0%	40%
San Francisco		20%	20%	20%		0%	0%	0%	0%	25%	0%	75%		0%	0%	0%	0%	1%	0%	99%		0%	0%	0%	0%	1%	0%	99%
Alameda		10%	10%	10%		70%	10%	0%	0%	10%	10%	0%		79%	10%	0%	0%	1%	10%	0%		79%	10%	0%	0%	1%	10%	0%
Howard Terminal Development		0	0	0		0%	0%	98%	2%	0%	0%	0%		0%	0%	98%	2%	0%	0%	0%		0%	0%	98%	2%	0%	0%	0%

Project 1.0 - Baseball - Departures

Attachment A

Mode Shift of Current BART Attendees

Current BART Destinations	Existing Coliseum BART Distribution			Mode Shift - Weekday Evening								Mode Shift - Weekday Day							Mode Shift - Weekend						
	Weekday Evening	Weekday Day	Weekend	Drive	TNC	Walk	Bike	Ferry	Bus	BART		Drive	TNC	Walk	Bike	Ferry	Bus	BART	Drive	TNC	Walk	Bike	Ferry	Bus	BART
12TH	2%	2%	2%		0%	57%	42%	1%	0%	0%	0%	0%	57%	40%	1%	0%	2%	0%	0%	58%	41%	1%	0%	0%	0%
19TH	2%	4%	2%		0%	76%	22%	2%	0%	0%	0%	0%	73%	20%	2%	0%	5%	0%	0%	74%	24%	2%	0%	0%	0%
MCAR	3%	2%	2%		0%	60%	0%	0%	0%	0%	40%	0%	60%	0%	0%	0%	0%	40%	0%	60%	0%	0%	0%	0%	40%
ASHB	2%	2%	1%		0%	40%	0%	0%	0%	0%	60%	0%	40%	0%	0%	0%	0%	60%	0%	40%	0%	0%	0%	0%	60%
ROCK	2%	2%	2%		0%	40%	0%	0%	0%	0%	60%	0%	40%	0%	0%	0%	0%	60%	0%	40%	0%	0%	0%	0%	60%
LAKE	4%	4%	4%		0%	51%	48%	1%	0%	0%	0%	0%	51%	48%	1%	0%	0%	0%	0%	51%	48%	1%	0%	0%	0%
FTVL	4%	7%	6%		0%	50%	0%	0%	0%	0%	50%	0%	50%	0%	0%	0%	0%	50%	0%	50%	0%	0%	0%	0%	50%
WOAK	1%	1%	1%		0%	73%	25%	2%	0%	0%	0%	0%	73%	25%	2%	0%	0%	0%	0%	73%	25%	2%	0%	0%	0%
EMBR	4%	5%	4%		0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	30%	0%	70%	0%	0%	0%	0%	20%	0%	80%
MONT	3%	2%	2%		0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	20%	0%	80%	0%	0%	0%	0%	15%	0%	85%

Mode Shift of Current Vehicles

Current Vehicle Destinations	Existing Coliseum Vehicle Distribution			Mode Shift - Weekday Evening								Mode Shift - Weekday Day							Mode Shift - Weekend						
	Weekday Evening	Weekday Day	Weekend	Drive	TNC	Walk	Bike	Ferry	Bus	BART		Drive	TNC	Walk	Bike	Ferry	Bus	BART	Drive	TNC	Walk	Bike	Ferry	Bus	BART
<1 mile from HT	1%	2%	2%		10%	23%	63%	2%	0%	2%	0%	10%	23%	63%	2%	0%	2%	0%	10%	23%	63%	2%	0%	2%	0%
1-2 miles from HT	2%	5%	2%		20%	58%	15%	2%	0%	5%	0%	20%	58%	15%	2%	0%	5%	0%	20%	58%	15%	2%	0%	5%	0%
2-5 miles from HT	24%	24%	23%		58%	40%	0%	0%	0%	2%	0%	58%	40%	0%	0%	0%	2%	0%	58%	40%	0%	0%	0%	2%	0%
Richmond	5%	6%	4%		95%	5%	0%	0%	0%	0%	0%	95%	5%	0%	0%	0%	0%	0%	95%	5%	0%	0%	0%	0%	0%
Near Coliseum	8%	9%	8%		50%	20%	0%	0%	0%	2%	28%	50%	20%	0%	0%	0%	2%	28%	50%	20%	0%	0%	0%	2%	28%

Geographic Shift of Current Attendees

Shifts Away

Current BART Destinations	Existing Coliseum BART Distribution			Percent of Distribution Lost		
	Weekday Evening	Weekday Day	Weekend	Weekday Evening	Weekday Day	Weekend
HAYW	3%	2%	3%	20%	20%	20%
SHAY	2%	2%	2%	30%	30%	30%
UCTY	3%	5%	3%	40%	40%	40%
FRMT	4%	5%	5%	50%	50%	50%
WSPR	4%	2%	2%	60%	60%	60%
CAST	3%	2%	5%	20%	20%	20%
WDUB	4%	5%	5%	30%	30%	30%
DUBL	11%	7%	12%	40%	40%	40%

Current Vehicle Destinations	Existing Coliseum Vehicle Distribution			Percent of Distribution Lost		
	Weekday Evening	Weekday Day	Weekend	Weekday Evening	Weekday Day	Weekend
20-25 mi SE of HT	5%	3%	5%	20%	20%	10%
25-30 mi SE of HT	4%	6%	5%	30%	30%	15%
30-40 mi SE of HT	4%	3%	4%	40%	40%	20%
40+ mi SE of HT	5%	4%	6%	50%	50%	25%

Shifts Towards

New Attendees Destinations	% of Attendees Gained				Drive	Mode Split - Weekday Evening								Mode Split - Weekday Day								Drive	Mode Split - Weekend							
	Weekday Evening	Weekday Day	Weekend			TNC	Walk	Bike	Ferry	Bus	BART		TNC	Walk	Bike	Ferry	Bus	BART		TNC	Walk		Bike	Ferry	Bus	BART				
Oakland/Piedmont	50%	50%	50%	50%		30%	31%	13%	1%	0%	3%	22%	30%	31%	13%	1%	0%	3%	22%	30%	31%	13%	1%	0%	3%	22%				
Central Contra Costa	20%	20%	20%			50%	10%	0%	0%	0%	40%		50%	10%	0%	0%	0%	40%		50%	10%	0%	0%	0%	40%					
San Francisco	20%	20%	20%			0%	0%	0%	0%	0%	100%		0%	0%	0%	0%	1%	0%	99%		0%	0%	0%	1%	0%	99%				
Alameda	10%	10%	10%			80%	10%	0%	0%	0%	10%	0%	79%	10%	0%	0%	1%	10%	0%	79%	10%	0%	0%	1%	10%	0%				
Howard Terminal Development	-	-	-			0%	0%	98%	2%	0%	0%	0%	0%	0%	98%	2%	0%	0%	0%	0%	0%	98%	2%	0%	0%	0%				

Project 1.0 Assumptions - Concerts - Arrivals

Attachment A

Mode Shift of Current BART Attendees

Current BART Origins	Existing Coliseum BART Distribution		Mode Shift							
	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART	
12TH	2%		0%	58%		41%	1%	0%	0%	0%
19TH	3%		0%	72%		24%	2%	0%	2%	0%
MCAR	2%		0%	60%		0%	0%	0%	0%	40%
ASHB	1%		0%	40%		0%	0%	0%	0%	60%
ROCK	2%		0%	40%		0%	0%	0%	0%	60%
LAKE	3%		0%	51%		48%	1%	0%	0%	0%
FTVL	4%		0%	50%		0%	0%	0%	0%	50%
WOAK	1%		0%	73%		25%	2%	0%	0%	0%
EMBR	5%		0%	0%		0%	0%	30%	0%	70%
MONT	2%		0%	0%		0%	0%	20%	0%	80%

Mode Shift of Current Vehicles

Current Vehicle Origins	Existing Coliseum Vehicle Distribution		Mode Shift							
	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART	
<1 mile from HT	4%		10%	23%		63%	2%	0%	2%	0%
1-2 miles from HT	5%		20%	58%		15%	2%	0%	5%	0%
2-5 miles from HT	27%		58%	40%		0%	0%	0%	2%	0%
Richmond	4%		95%	5%		0%	0%	0%	0%	0%
Near Coliseum	7%		50%	20%		0%	0%	0%	2%	28%

Geographic Shift of Current Attendees

Shifts Away

Current BART Origins	Existing Coliseum BART Distribution		Percent of Distribution Lost	
	Weekend		Weekend	
HAYW	2%		20%	
SHAY	1%		30%	
UCTY	3%		40%	
FRMT	6%		50%	
WSPR	3%		60%	
CAST	2%		20%	
WDUB	3%		30%	
DUBL	8%		40%	

Current Vehicle Origins	Existing Coliseum Vehicle Distribution		Percent of Distribution Lost	
	Weekend		Weekend	
20-25 mi SE of HT	5%		10%	
25-30 mi SE of HT	5%		15%	
30-40 mi SE of HT	4%		20%	
40+ mi SE of HT	4%		25%	

Shifts Towards

New Attendees Origins	% of Attendees Gained		Mode Split							
	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART	
Oakland/Piedmont	50%		30%	31%		13%	1%	0%	3%	22%
Central Contra Costa	20%		50%	10%		0%	0%	0%	0%	40%
San Francisco	20%		0%	0%		0%	0%	1%	0%	99%
Alameda	10%		79%	10%		0%	0%	1%	10%	0%
Howard Terminal Development	-		0%	0%		98%	2%	0%	0%	0%

Project 1.0 Assumptions - Concerts - Departure

Attachment A

Mode Shift of Current BART Attendees

Current BART Destinations	Existing Coliseum BART Distribution		Mode Shift							
	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART	
12TH	2%			0%	58%	41%	1%	0%	0%	0%
19TH	3%			0%	74%	24%	2%	0%	0%	0%
MCAR	2%			0%	60%	0%	0%	0%	0%	40%
ASHB	1%			0%	40%	0%	0%	0%	0%	60%
ROCK	2%			0%	40%	0%	0%	0%	0%	60%
LAKE	3%			0%	51%	48%	1%	0%	0%	0%
FTVL	4%			0%	50%	0%	0%	0%	0%	50%
WOAK	1%			0%	73%	25%	2%	0%	0%	0%
EMBR	5%			0%	0%	0%	0%	0%	0%	100%
MONT	2%			0%	0%	0%	0%	0%	0%	100%

Mode Shift of Current Vehicles

Current Vehicle Destinations	Existing Coliseum Vehicle Distribution		Mode Shift							
	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART	
<1 mile from HT	4%			10%	23%	63%	2%	0%	2%	0%
1-2 miles from HT	5%			20%	58%	15%	2%	0%	5%	0%
2-5 miles from HT	27%			58%	40%	0%	0%	0%	2%	0%
Richmond	4%			95%	5%	0%	0%	0%	0%	0%
Near Coliseum	8%			50%	20%	0%	0%	0%	2%	28%

Geographic Shift of Current Attendees

Shifts Away

Current BART Destinations	Existing Coliseum BART Distribution		Percent of Distribution Lost	
	Weekend		Weekend	
HAYW	2%		20%	
SHAY	1%		30%	
UCTY	3%		40%	
FRMT	6%		50%	
WSPR	3%		60%	
CAST	2%		20%	
WDUB	3%		30%	
DUBL	8%		40%	

Current Vehicle Destinations	Existing Coliseum Vehicle Distribution		Percent of Distribution Lost	
	Weekend		Weekend	
20-25 mi SE of HT	5%		10%	
25-30 mi SE of HT	5%		15%	
30-40 mi SE of HT	4%		20%	
40+ mi SE of HT	4%		25%	

Shifts Towards

New Attendees Origins	% of Attendees Gained		Mode Split							
	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART	
Oakland/Piedmont	50%		30%	31%		13%	1%	0%	3%	22%
Central Contra Costa	20%		50%	10%		0%	0%	0%	0%	40%
San Francisco	20%		0%	0%		0%	0%	1%	0%	99%
Alameda	10%		79%	10%		0%	0%	1%	10%	0%
Howard Terminal Development	-		0%	0%		98%	2%	0%	0%	0%

Project 2.0 - Baseball - Arrivals

Attachment A

Mode Shift of Current BART Attendees

Current BART Origins	Existing Coliseum BART Distribution			Drive	Mode Shift - Weekday Evening							Drive	Mode Shift - Weekday Day							Drive	Mode Shift - Weekend						
	Weekday Evening	Weekday Day	Weekend		TNC	Walk	Bike	Ferry	Bus	BART	TNC		Walk	Bike	Ferry	Bus	BART	TNC	Walk		Bike	Ferry	Bus	BART			
12TH	3%	3%	2%	0%	23%	65%	5%	0%	7%	0%	0%	23%	65%	5%	0%	7%	0%	0%	24%	71%	5%	0%	0%	0%			
19TH	3%	4%	2%	0%	52%	25%	8%	0%	15%	0%	0%	52%	25%	8%	0%	15%	0%	0%	61%	29%	8%	0%	2%	0%			
MCAR	2%	2%	2%	0%	47%	0%	3%	0%	0%	50%	0%	47%	0%	3%	0%	0%	50%	0%	47%	0%	3%	0%	0%	50%			
ASHB	1%	1%	1%	0%	27%	0%	3%	0%	0%	70%	0%	27%	0%	3%	0%	0%	70%	0%	27%	0%	3%	0%	0%	70%			
ROCK	2%	2%	2%	0%	27%	0%	3%	0%	0%	70%	0%	27%	0%	3%	0%	0%	70%	0%	27%	0%	3%	0%	0%	70%			
LAKE	3%	3%	3%	0%	27%	68%	5%	0%	0%	0%	0%	27%	68%	5%	0%	0%	0%	0%	27%	68%	5%	0%	0%	0%			
FTVL	3%	6%	4%	0%	32%	0%	3%	0%	0%	65%	0%	32%	0%	3%	0%	0%	65%	0%	32%	0%	3%	0%	0%	65%			
WOAK	1%	1%	1%	0%	37%	55%	8%	0%	0%	0%	0%	37%	55%	8%	0%	0%	0%	0%	37%	55%	8%	0%	0%	0%			
EMBR	6%	4%	4%	0%	0%	0%	0%	30%	0%	70%	0%	0%	0%	0%	5%	0%	95%	0%	0%	0%	0%	5%	0%	95%			
MONT	5%	3%	2%	0%	0%	0%	0%	20%	0%	80%	0%	0%	0%	0%	3%	0%	97%	0%	0%	0%	0%	3%	0%	97%			

Mode Shift of Current Vehicles

Current Vehicle Origins	Existing Coliseum Vehicle Distribution			Mode Shift - Weekday Evening							Mode Shift - Weekday Day							Mode Shift - Weekend							
	Weekday Evening	Weekday Day	Weekend	Drive	TNC	Walk	Bike	Ferry	Bus	BART	Drive	TNC	Walk	Bike	Ferry	Bus	BART	Drive	TNC	Walk	Bike	Ferry	Bus	BART	
<1 mile from HT	3%	2%	1%		10%	0%	75%	8%	0%	7%	0%	10%	0%	75%	8%	0%	7%	0%	10%	0%	75%	8%	0%	7%	0%
1-2 miles from HT	3%	3%	3%		45%	22%	15%	8%	0%	10%	0%	45%	22%	15%	8%	0%	10%	0%	45%	22%	15%	8%	0%	10%	0%
2-5 miles from HT	26%	24%	25%		78%	16%	0%	3%	0%	3%	0%	78%	16%	0%	3%	0%	3%	0%	78%	16%	0%	3%	0%	3%	0%
Richmond	5%	6%	4%		95%	5%	0%	0%	0%	0%	0%	95%	5%	0%	0%	0%	0%	0%	95%	5%	0%	0%	0%	0%	0%
Near Coliseum	9%	9%	7%		57%	5%	0%	0%	0%	2%	36%	57%	5%	0%	0%	0%	2%	36%	57%	5%	0%	0%	0%	2%	36%

Geographic Shift of Current Attendees

Shifts Away

Current BART Origins	Existing Coliseum BART Distribution			Percent of Distribution Lost		
	Weekday Evening	Weekday Day	Weekend	Weekday Evening	Weekday Day	Weekend
HAYW	2%	2%	3%	20%	20%	20%
SHAY	1%	2%	1%	30%	30%	30%
UCTY	3%	4%	3%	40%	40%	40%
FRMT	4%	4%	5%	50%	50%	50%
WSPR	3%	3%	2%	60%	60%	60%
CAST	3%	2%	4%	20%	20%	20%
WDUB	4%	5%	5%	30%	30%	30%
DUBL	10%	8%	12%	40%	40%	40%

Current Vehicle Origins	Existing Coliseum Vehicle Distribution			Percent of Distribution Lost		
	Weekday Evening	Weekday Day	Weekend	Weekday Evening	Weekday Day	Weekend
20-25 mi SE of HT	5%	5%	5%	20%	20%	10%
25-30 mi SE of HT	4%	5%	5%	30%	30%	15%
30-40 mi SE of HT	4%	4%	4%	40%	40%	20%
40+ mi SE of HT	3%	5%	5%	50%	50%	25%

Shifts Towards

New Attendees Origins	% of Attendees Gained				Mode Split - Weekday Evening								Mode Split - Weekday Day								Mode Split - Weekend							
	Weekday Evening	Weekday Day	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART		Drive	TNC	Walk	Bike	Ferry	Bus	BART		Drive	TNC	Walk	Bike	Ferry	Bus	BART	
Oakland/Piedmont		50%	50%	50%		30%	17%	13%	4%	0%	4%	32%		30%	17%	13%	4%	0%	4%	32%		30%	17%	13%	4%	0%	4%	32%
Central Contra Costa		20%	20%	20%		55%	5%	0%	0%	0%	0%	40%		55%	5%	0%	0%	0%	0%	40%		55%	5%	0%	0%	0%	40%	
San Francisco		20%	20%	20%		0%	0%	0%	0%	25%	0%	75%		0%	0%	0%	0%	1%	0%	99%		0%	0%	0%	0%	1%	0%	99%
Alameda		10%	10%	10%		75%	5%	0%	0%	10%	10%	0%		84%	5%	0%	0%	1%	10%	0%		84%	5%	0%	0%	1%	10%	0%
Howard Terminal Development		0	0	0		0%	0%	92%	8%	0%	0%	0%		0%	0%	92%	8%	0%	0%	0%		0%	0%	92%	8%	0%	0%	0%

Project 2.0 - Baseball - Departures

Attachment A

Mode Shift of Current BART Attendees

Current BART Destinations	Existing Coliseum BART Distribution			Mode Shift - Weekday Evening								Mode Shift - Weekday Day								Mode Shift - Weekend						
	Weekday Evening	Weekday Day	Weekend	Drive	TNC	Walk	Bike	Ferry	Bus	BART		Drive	TNC	Walk	Bike	Ferry	Bus	BART		Drive	TNC	Walk	Bike	Ferry	Bus	BART
12TH	2%	2%	2%		0%	18%	72%	5%	0%	5%	0%	0%	23%	65%	5%	0%	7%	0%		0%	19%	71%	5%	0%	5%	0%
19TH	2%	4%	2%		0%	65%	27%	8%	0%	0%	0%	0%	52%	25%	8%	0%	15%	0%		0%	63%	29%	8%	0%	0%	0%
MCAR	3%	2%	2%		0%	47%	0%	3%	0%	0%	50%	0%	47%	0%	3%	0%	0%	50%		0%	47%	0%	3%	0%	0%	50%
ASHB	2%	2%	1%		0%	27%	0%	3%	0%	0%	70%	0%	27%	0%	3%	0%	0%	70%		0%	27%	0%	3%	0%	0%	70%
ROCK	2%	2%	2%		0%	27%	0%	3%	0%	0%	70%	0%	27%	0%	3%	0%	0%	70%		0%	27%	0%	3%	0%	0%	70%
LAKE	4%	4%	4%		0%	27%	68%	5%	0%	0%	0%	0%	27%	68%	5%	0%	0%	0%		0%	27%	68%	5%	0%	0%	0%
FTVL	4%	7%	6%		0%	32%	0%	3%	0%	0%	65%	0%	32%	0%	3%	0%	0%	65%		0%	32%	0%	3%	0%	0%	65%
WOAK	1%	1%	1%		0%	37%	55%	8%	0%	0%	0%	0%	37%	55%	8%	0%	0%	0%		0%	37%	55%	8%	0%	0%	0%
EMBR	4%	5%	4%		0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	30%	0%	70%		0%	0%	0%	0%	20%	0%	80%
MONT	3%	2%	2%		0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	20%	0%	80%		0%	0%	0%	0%	15%	0%	85%

Mode Shift of Current Vehicles

Current Vehicle Destinations	Existing Coliseum Vehicle Distribution			Mode Shift - Weekday Evening								Mode Shift - Weekday Day								Mode Shift - Weekend						
	Weekday Evening	Weekday Day	Weekend	Drive	TNC	Walk	Bike	Ferry	Bus	BART		Drive	TNC	Walk	Bike	Ferry	Bus	BART		Drive	TNC	Walk	Bike	Ferry	Bus	BART
<1 mile from HT	1%	2%	2%		10%	0%	78%	8%	0%	4%	0%	10%	0%	75%	8%	0%	7%	0%		10%	0%	78%	8%	0%	4%	0%
1-2 miles from HT	2%	5%	2%		45%	22%	15%	8%	0%	10%	0%	45%	22%	15%	8%	0%	10%	0%		45%	22%	15%	8%	0%	10%	0%
2-5 miles from HT	24%	24%	23%		78%	16%	0%	3%	0%	3%	0%	78%	16%	0%	3%	0%	3%	0%		78%	16%	0%	3%	0%	3%	0%
Richmond	5%	6%	4%		95%	5%	0%	0%	0%	0%	0%	95%	5%	0%	0%	0%	0%	0%		95%	5%	0%	0%	0%	0%	0%
Near Coliseum	8%	9%	8%		56%	5%	0%	0%	0%	3%	36%	56%	5%	0%	0%	0%	3%	36%		57%	5%	0%	0%	0%	2%	36%

Geographic Shift of Current Attendees

Shifts Away

Current BART Destinations	Existing Coliseum BART Distribution			Percent of Distribution Lost		
	Weekday Evening	Weekday Day	Weekend	Weekday Evening	Weekday Day	Weekend
HAYW	3%	2%	3%	20%	20%	20%
SHAY	2%	2%	2%	30%	30%	30%
UCTY	3%	5%	3%	40%	40%	40%
FRMT	4%	5%	5%	50%	50%	50%
WSPR	4%	2%	2%	60%	60%	60%
CAST	3%	2%	5%	20%	20%	20%
WDUB	4%	5%	5%	30%	30%	30%
DUBL	11%	7%	12%	40%	40%	40%

Current Vehicle Destinations	Existing Coliseum Vehicle Distribution			Percent of Distribution Lost		
	Weekday Evening	Weekday Day	Weekend	Weekday Evening	Weekday Day	Weekend
20-25 mi SE of HT	5%	3%	5%	20%	20%	10%
25-30 mi SE of HT	4%	6%	5%	30%	30%	15%
30-40 mi SE of HT	4%	3%	4%	40%	40%	20%
40+ mi SE of HT	5%	4%	6%	50%	50%	25%

Shifts Towards

New Attendees Destinations	% of Attendees Gained				Mode Split - Weekday Evening								Mode Split - Weekday Day								Mode Split - Weekend						
	Weekday Evening	Weekday Day	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART		Drive	TNC	Walk	Bike	Ferry	Bus	BART		Drive	TNC	Walk	Bike	Ferry	Bus	BART
Oakland/Piedmont	50%	50%	50%	50%		30%	17%	13%	4%	0%	4%	32%	30%	17%	13%	4%	0%	4%	32%		30%	17%	13%	4%	0%	4%	32%
Central Contra Costa	20%	20%	20%	20%		55%	5%	0%	0%	0%	0%	40%	55%	5%	0%	0%	0%	0%	40%		55%	5%	0%	0%	0%	0%	40%
San Francisco	20%	20%	20%	20%		0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	1%	0%	99%	0%		0%	0%	0%	0%	1%	0%	99%
Alameda	10%	10%	10%	10%		85%	5%	0%	0%	0%	10%	0%	84%	5%	0%	0%	1%	10%	0%		84%	5%	0%	0%	1%	10%	0%
Howard Terminal Development	-	-	-	-		0%	0%	92%	8%	0%	0%	0%	0%	0%	92%	8%	0%	0%	0%		0%	0%	92%	8%	0%	0%	0%

Project 2.0 Assumptions - Concerts - Arrivals

Attachment A

Mode Shift of Current BART Attendees

Current BART Origins	Existing Coliseum BART Distribution		Mode Shift							
	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART	
12TH	2%		0%	24%		71%	5%	0%	0%	0%
19TH	3%		0%	61%		29%	8%	0%	2%	0%
MCAR	2%		0%	47%		0%	3%	0%	0%	50%
ASHB	1%		0%	27%		0%	3%	0%	0%	70%
ROCK	2%		0%	27%		0%	3%	0%	0%	70%
LAKE	3%		0%	27%		68%	5%	0%	0%	0%
FTVL	4%		0%	32%		0%	3%	0%	0%	65%
WOAK	1%		0%	37%		55%	8%	0%	0%	0%
EMBR	5%		0%	0%		0%	0%	30%	0%	70%
MONT	2%		0%	0%		0%	0%	20%	0%	80%

Mode Shift of Current Vehicles

Current Vehicle Origins	Existing Coliseum Vehicle Distribution		Mode Shift							
	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART	
<1 mile from HT	4%		10%	0%		75%	8%	0%	7%	0%
1-2 miles from HT	5%		45%	22%		15%	8%	0%	10%	0%
2-5 miles from HT	27%		78%	16%		0%	3%	0%	3%	0%
Richmond	4%		95%	5%		0%	0%	0%	0%	0%
Near Coliseum	7%		57%	5%		0%	0%	0%	2%	36%

Geographic Shift of Current Attendees

Shifts Away

Current BART Origins	Existing Coliseum BART Distribution		Percent of Distribution Lost	
	Weekend		Weekend	
HAYW	2%		20%	
SHAY	1%		30%	
UCTY	3%		40%	
FRMT	6%		50%	
WSPR	3%		60%	
CAST	2%		20%	
WDUB	3%		30%	
DUBL	8%		40%	

Current Vehicle Origins	Existing Coliseum Vehicle Distribution		Percent of Distribution Lost	
	Weekend		Weekend	
20-25 mi SE of HT	5%		10%	
25-30 mi SE of HT	5%		15%	
30-40 mi SE of HT	4%		20%	
40+ mi SE of HT	4%		25%	

Shifts Towards

New Attendees Origins	% of Attendees Gained		Mode Split							
	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART	
Oakland/Piedmont	50%		30%	17%		13%	4%	0%	4%	32%
Central Contra Costa	20%		55%	5%		0%	0%	0%	40%	
San Francisco	20%		0%	0%		0%	0%	1%	0%	99%
Alameda	10%		84%	5%		0%	0%	1%	10%	0%
Howard Terminal Development	-		0%	0%		92%	8%	0%	0%	0%

Project 2.0 Assumptions - Concerts - Departure

Attachment A

Mode Shift of Current BART Attendees

Current BART Destinations	Existing Coliseum BART Distribution		Mode Shift							
	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART	
12TH	2%		0%	19%		71%	5%	0%	5%	0%
19TH	3%		0%	63%		29%	8%	0%	0%	0%
MCAR	2%		0%	47%		0%	3%	0%	0%	50%
ASHB	1%		0%	27%		0%	3%	0%	0%	70%
ROCK	2%		0%	27%		0%	3%	0%	0%	70%
LAKE	3%		0%	27%		68%	5%	0%	0%	0%
FTVL	4%		0%	32%		0%	3%	0%	0%	65%
WOAK	1%		0%	37%		55%	8%	0%	0%	0%
EMBR	5%		0%	0%		0%	0%	0%	0%	100%
MONT	2%		0%	0%		0%	0%	0%	0%	100%

Mode Shift of Current Vehicles

Current Vehicle Destinations	Existing Coliseum Vehicle Distribution		Mode Shift							
	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART	
<1 mile from HT	4%		10%	0%		78%	8%	0%	4%	0%
1-2 miles from HT	5%		45%	22%		15%	8%	0%	10%	0%
2-5 miles from HT	27%		78%	16%		0%	3%	0%	3%	0%
Richmond	4%		95%	5%		0%	0%	0%	0%	0%
Near Coliseum	8%		57%	5%		0%	0%	0%	2%	36%

Geographic Shift of Current Attendees

Shifts Away

Current BART Destinations	Existing Coliseum BART Distribution		Percent of Distribution Lost	
	Weekend		Weekend	
HAYW	2%		20%	
SHAY	1%		30%	
UCTY	3%		40%	
FRMT	6%		50%	
WSPR	3%		60%	
CAST	2%		20%	
WDUB	3%		30%	
DUBL	8%		40%	

Current Vehicle Destinations	Existing Coliseum Vehicle Distribution		Percent of Distribution Lost	
	Weekend		Weekend	
20-25 mi SE of HT	5%		10%	
25-30 mi SE of HT	5%		15%	
30-40 mi SE of HT	4%		20%	
40+ mi SE of HT	4%		25%	

Shifts Towards

New Attendees Origins	% of Attendees Gained		Mode Split							
	Weekend		Drive	TNC	Walk	Bike	Ferry	Bus	BART	
Oakland/Piedmont	50%		30%	17%		13%	4%	0%	4%	32%
Central Contra Costa	20%		55%	5%		0%	0%	0%	0%	40%
San Francisco	20%		0%	0%		0%	0%	1%	0%	99%
Alameda	10%		84%	5%		0%	0%	1%	10%	0%
Howard Terminal Development	-		0%	0%		92%	8%	0%	0%	0%



APPENDIX B

ATLANTA BALLPARK RELOCATION TRIP DISTRIBUTION CASE STUDY



BALLPARK RELOCATION TRIP DISTRIBUTION ANALYSIS

Fehr & Peers utilized aggregated smartphone location data (known as “location-based services”) from StreetLight Data to evaluate how attendee trip distribution changed when the home field of the Atlanta Braves baseball team was moved from Turner Field just south of downtown Atlanta to SunTrust Park 15 vehicle-miles northwest. The results from this case study analysis were then used to inform the extent to which a change in geographic distribution of attendees can be expected with the move of the Oakland A’s ballpark six miles from the Coliseum to Howard Terminal. While distances vary the time to travel 15 miles to the SunTrust Park is equivalent to the travel time to Howard Terminal.

In general, a given trip is less likely to be taken the more costly it is in terms of time and expense, while a quicker, shorter, and less expensive trip is more likely to be taken. In the context of a highly-specialized event with a dedicated fanbase it is commonly assumed that the distribution of attendees may not shift to a significant degree, as geographic proximity and ease of access may be less significant causes of attendance compared to interest in the event. This case study assessed whether and to what extent the Atlanta Braves’ move resulted in a distributional shift of attendees towards areas that were closer to the new ballpark and away from areas that were further away from the new ballpark.

Although the Atlanta case study concerns a move away from downtown to a more outlying location rather than a move from an outlying location to near downtown, as with the move to Howard Terminal, the results still provide relevant information about the elasticity of attendee origins for those who drive.

DATA SELECTION

When a smartphone with location-based services enabled runs an app that utilizes those services (such as Google Maps), the phone transmits the user’s location along with a unique user ID number. This information provides location information to within 60 feet and is used by StreetLight Data



along with GPS devices, connected vehicles and more to determine the routes of individual person trips by linking the travel paths of these users to the roadway network.¹

For the Atlanta ballpark case study analysis described below, Fehr & Peers used location-based services data collected on weekday evenings from 5:00 PM to 7:00 PM with a baseball game at Turner Field for the 2016 season and SunTrust Park for the 2017 season. The 5:00 PM to 7:00 PM period represents the two hours prior to the start of games, when the majority of attendees will arrive by automobile. A detailed description of the zones used for the analysis is provided in the following section.

Using location-based services data means that all distributions in this analysis are estimates based on samples, rather than on counts of all trips over a designated period. For a sample to provide a reliable estimate of the entire population, it must be unbiased and large enough to mitigate the impact of random chance error.

An unbiased sample is one in which all individuals in the population have an equal chance of being selected. With an unbiased sample, error in the estimate is due to random chance alone and is not a result of the sample selection process. With location-based services data, not all travelers have an equal chance of being included in the sample, since the data can capture only travelers that have a smartphone with location-based services enabled. However, this potential source of bias would not substantially affect the results of this analysis because any bias that is introduced due to a difference between those with smartphones with location-based services enabled and those without would apply to both distributions, and this analysis is concerned only with observing any differences between the distributions at the two ballparks rather than providing explicit distributional estimates.

A large enough sample is one that has enough data points to allow for confidence that the sample estimate is a good representation of the population as a whole, with the error due to random chance likely to be relatively small. The sample size for the Turner Field distribution was about 2,000, and the sample size for the SunTrust Park distribution was about 7,000. These sample sizes correspond with standard errors of less than 1% for the analyzed distributions, assuming an unbiased sample.

¹ More information on the data source can be found at <https://www.streetlightdata.com/>



ZONE SELECTION

ORIGIN ZONES

Zones for ballpark attendee trip origins were drawn based on rough changes in travel distances between Turner Field and SunTrust Park. Four zones representing areas southeast of Turner Field were drawn with radii of five miles, 10 miles, 15 miles, and 40 miles to represent attendees for whom the new ballpark represented a substantial increase in travel distance and time. Similarly, four zones representing areas within five, 10, 15, and 40 miles northwest of SunTrust Park were drawn to represent attendees for whom the new ballpark represented a substantially reduced travel distance and time.

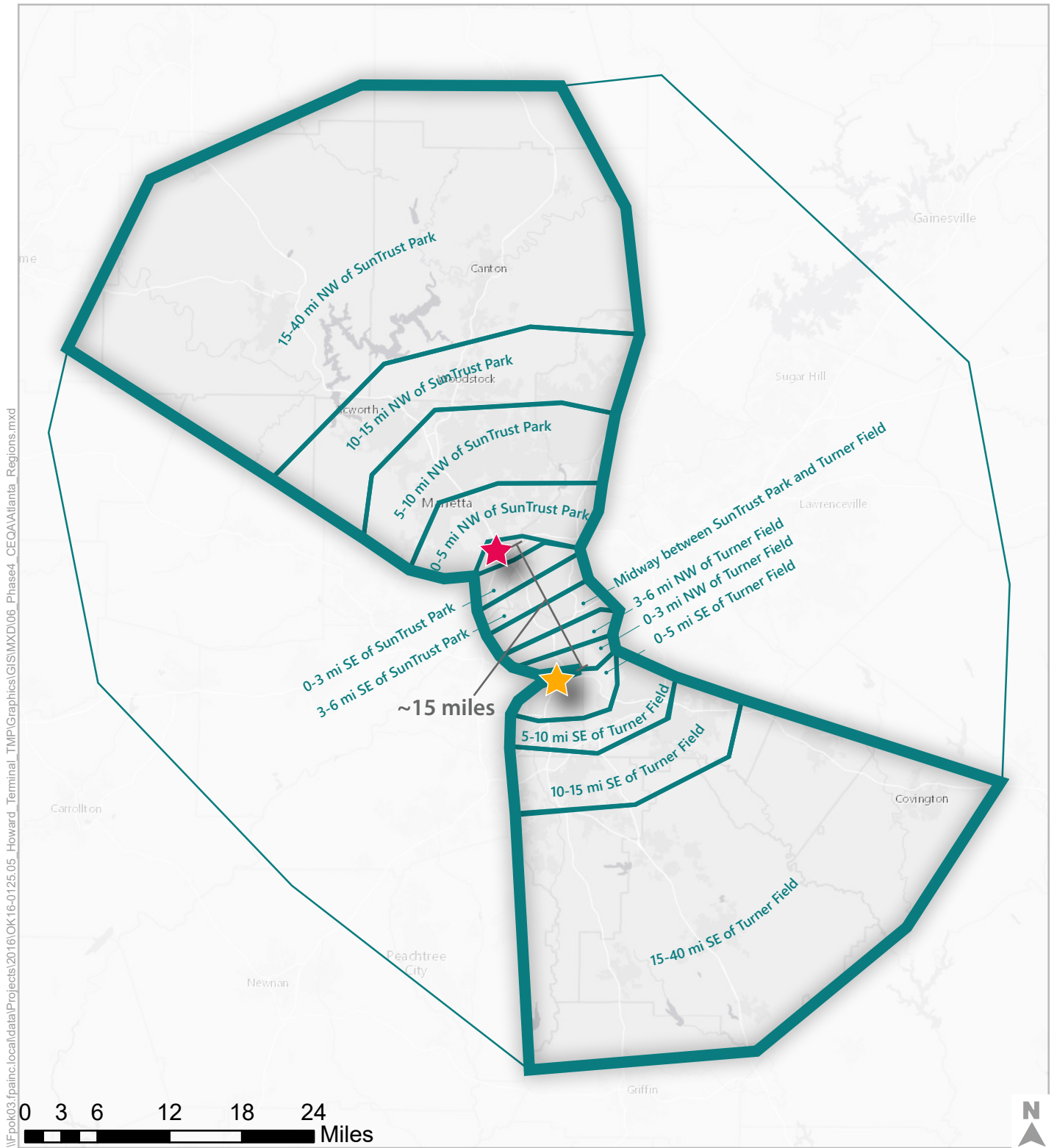
Five zones, each approximately three miles in width, were drawn between the two ballparks. Attendees from these zones experienced a more moderate change in travel distances, although travel speeds from these zones are typically faster traveling northbound to SunTrust Park than they are traveling southbound to Turner Field through downtown Atlanta during the 5:00 PM to 7:00 PM study period.

In addition to the study zones described above, the area that was not included in one of the zones described above but was within approximately a 40-mile radius of the midpoint of the two ballparks was also included to help establish the magnitude of the overall change in attendee distribution. This zone encompasses a large area, and some attendees from this zone may have had their travel times shortened by the move to SunTrust Park, while others may have had their travel times lengthened. However, travel time differences for attendees within this zone are generally less significant than for those in the study zones.

Figure 1 maps all origin zones used for this analysis.

DESTINATION ZONES

Destination zones for the Turner Field analysis used pass-through zones for entering vehicles at the entrances of the official attendee parking lots directly north of Turner Field. These lots represent most of the easily-accessible parking near the ballpark.



Legend

★ SunTrust Park (new stadium)

★ Turner Field (old stadium)



Figure 1: Atlanta Ballpark Analysis Zones



At SunTrust Park, some parking for baseball games is provided in dedicated garages, and some is provided in nearby lots shared with commercial uses. The entrances of the shared lots are controlled on gamedays, with only baseball game attendees allowed to enter and park. The entrances of all designated parking lots that are available for all weekday evening games were used as destination pass-through zones for entering vehicles, with the exception of the Red Deck and valet decks, where entrances could not be isolated from other traffic traveling through the area.

RESULTS

For both the 2016 season at Turner Field and the 2017 season at SunTrust Park, the analyzed origin zones southeast of Turner Field, northwest of SunTrust Park, and between the two ballparks represented 81% of all Atlanta-area trips to Braves games. The other 19% of trips originated in the large zones to the east and west. The percentage of the total regional trips to Braves games originating in each analysis zone is presented in **Table 1**.

As shown in Table 1, the distribution of attendee origins shifted dramatically following the move from Turner Field to SunTrust Park, with a much smaller percentage of attendees traveling from areas that required longer travel distances to reach SunTrust Park and a much greater percentage of attendees whose travel distances were shortened by the move. In 2016, almost half of trips originated from within five or six miles of Turner Field, whereas less than 10% did so in 2017. Similarly, while less than 10% of trips to Braves games originated within three to five miles of SunTrust Park in 2016, over 40% of trips in 2017 originated from that area. These results strongly suggest that the distribution of baseball game attendee origins is indeed sensitive to changes in travel distances.



TABLE 1
WEEKDAY EVENING ATTENDEE ORIGIN TRIP DISTRIBUTIONS FROM STUDY ZONES
EXPRESSED GEOGRAPHICALLY NORTH TO SOUTH

Analysis Zone	Turner Field 2016	SunTrust Park 2017
15-40 mi NW of SunTrust Park	<1%	2%
10-15 mi NW of SunTrust Park	1%	5%
5-10 mi NW of SunTrust Park	3%	13%
0-5 mi NW of SunTrust Park	4%	24%
SunTrust Park		
0-3 mi SE of SunTrust Park	2%	17%
3-6 mi SE of SunTrust Park	2%	4%
Midway between SunTrust Park and Turner Field	10%	4%
3-6 mi NW of Turner Field	11%	4%
0-3 mi NW of Turner Field	24%	4%
Turner Field		
0-5 mi SE of Turner Field	12%	1%
5-10 mi SE of Turner Field	3%	1%
10-15 mi SE of Turner Field	4%	1%
15-40 mi SE of Turner Field	5%	1%

Sources: StreetLight Data, Fehr & Peers, 2019.

APPLICATION TO HOWARD TERMINAL

The geographic shift caused by the move from the Coliseum to Howard Terminal was conservatively assumed to be smaller than the observed shift between Turner Field and SunTrust Park due to the shorter move in Oakland and a geographic feature of the Atlanta Braves fanbase that may have exacerbated trip origin changes. **Figure 2** shows the assumed reductions in the vehicle trip origin distribution for attendees south of the Coliseum. At the same time, Oakland/Piedmont, Central Contra Costa, and Alameda were assumed to gain vehicle trips due to being closer to the new ballpark.

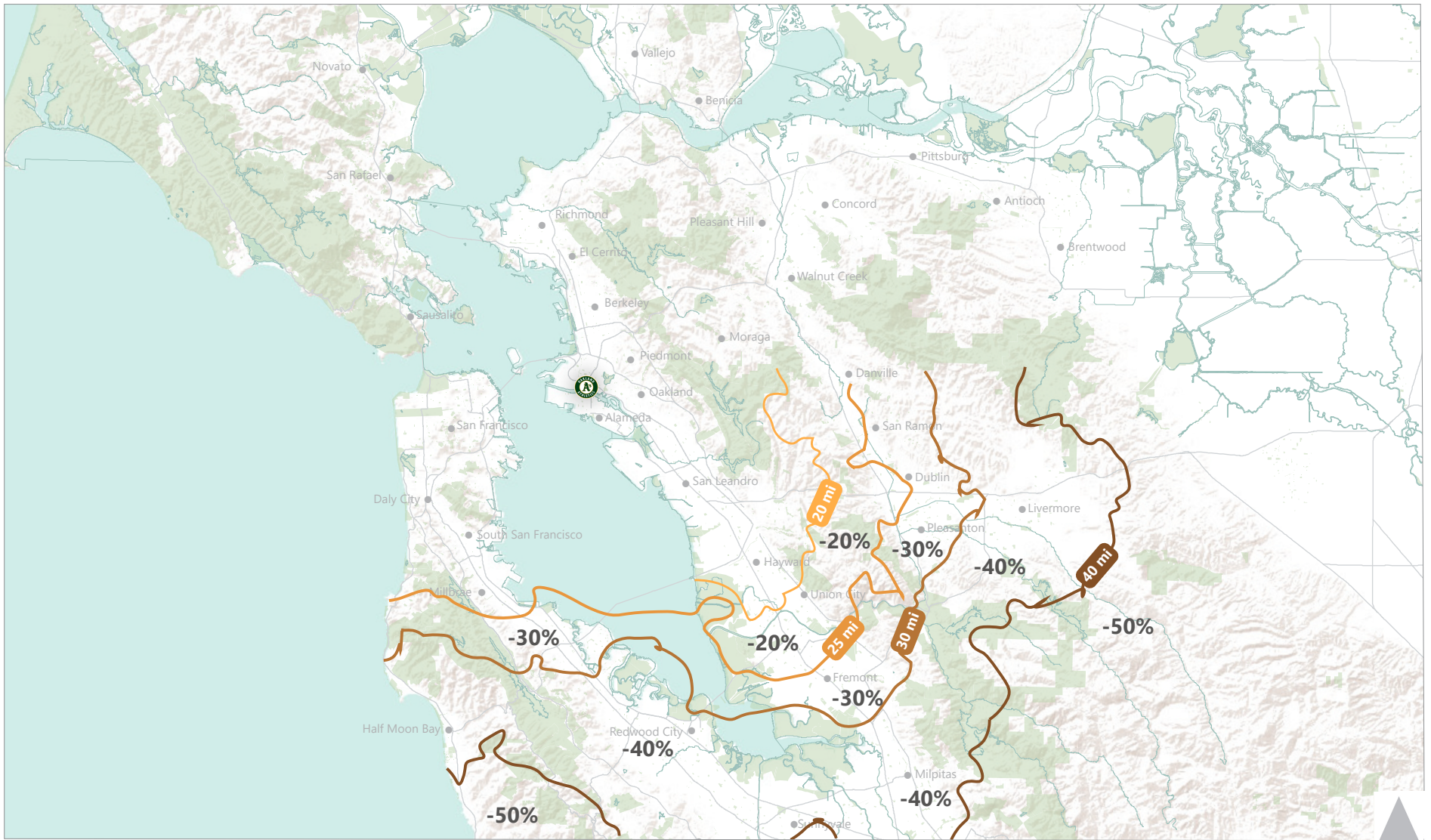


Figure 2: Geographic Redistribution of A's Attendees



Howard Terminal is about six miles by car away from the Coliseum, compared to the 15-mile travel distance between the Atlanta ballparks, though the I-880 corridor in Oakland is generally more congested than the expressways connecting the two Atlanta ballparks. According to Google Maps, attendees traveling northbound on I-880 to Howard Terminal would have about 25-minute longer trip than to the Coliseum, while those traveling northbound from southeast of Turner Field experienced about a 20-minute longer trip to SunTrust Park. In the other direction, those traveling southbound to Howard Terminal would only save about 10 minutes, whereas those from northwest of SunTrust Park traveling southbound saved approximately 30 minutes.

Although the added travel time for those driving from south of the Coliseum would be similar to the added travel time for those driving from south of Turner Field to SunTrust Park, the travel time savings for those driving from north of Howard Terminal are much less than the savings for those driving from north of Sun Trust Park. The change in distribution from a move to Howard Terminal would therefore be expected to be somewhat less than the observed change in distribution from the move from Turner Field to SunTrust Park.